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Behind the Universe



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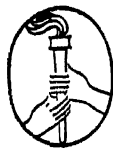
Behind the Universe

A DOCTOR'S RELIGION

By Louis Berman, M. D.

In my solitary and retired imagination
I remember I am not alone.

THOMAS BROWNE, M.D.
Religio Medici, 1643



Harper & Brothers Publishers
New York and London

BEHIND THE UNIVERSE

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Behind the Universe

name of the real usually applies. They are, in fact, the rulers of the inner world which men have always recognized as their internal reality, the inner world which can be contrasted with the external world objectively known in common with other human beings. Ideas pursue a life of their own, with attributes of their own, functioning autonomously, influencing behavior imaginatively and consistently, compulsively and dogmatically. They possess an inherent vitality which confers upon them a validity of their own, correlated with, yet wholly independent of their correspondence with the physical.

All that makes human history essentially different from animal life, all that makes comparative psychology different from human psychology, is contained in this distinction between the world of psycho-reality and that of physico-reality. It is because of these constants of his psycho-reality that man has become so different in quality from the animals out of whose flesh he has evolved. By the dominance of ideas in the stream of his psychic life, a special quality is conferred upon the consciousness and behavior of man. His concepts are the nets and filters of all his experiences, through which they must be caught and strained. It is indeed through his psycho-reality that man becomes the measure of all things. Through them he becomes also their maker and master, by means of which he governs and changes them, exalts or destroys them, nourishes or starves them. His ideas are catalysts in the creative fermentations of consciousness.

There is a continuous passage of these psychic enzymes from the individual to the general consciousness. Once articulated they become universally distributed. But they are always engendered in the thought gestation of some particular individual. How an individual brain becomes impregnated with its idea-seed, how its gestation proceeds, and how it suddenly is delivered, belongs to the scientific study of psychation—the dynamic process within the psycho-reality.

It would seem that ideas are begotten in a single brain by some ordering principle. The nature of that ordering principle holds the secrets of their immortality. It also is the link between the two worlds of the psychic and the physical. For these patterns of psychation manifest their powers not only in words and phrases. Their symbols materialize also in sculptured stone or plastic painting and in the harmonic sequences of music and they move in the rhythmic designs of feet and hands.

The elementary function of ideas is to serve as a means of control of the environment, of checking and interpreting the endless flux of experience which would be a chaos without them. But it is as meaningful symbols that they exert their most potent influence. They come to constitute a system of values and a scale of estimations. They force action or impose inaction, and thus may be looked upon as either slaves or masters of the self. Even in the mechanical world of fact, the physical universe of modern science, must be recognized dependence upon these controllers of psycho-reality. For the concept of an indifferent and impersonal physico-reality is itself only one of the total mass of ideas. The idea of an objective approach to the crudely perceived material of the senses, the appetites and instincts, has created the enormous structure of knowledge which is science.

Yet there is no compulsion for us to forget to what degree facts of science are bound to human sensitivity, human curiosity, human need, in short human psychation. Within the realm of ideas the question can still be raised, as the fundamental problem of every human consciousness and every human adventure: just how neutral, how impersonal, how disinterested in human life is the physico-reality of modern science? How can it be related to the older contents of the psycho-reality of mankind? There has developed a great doubt and a vast confusion concerning the relation of the scientifically known and explored cosmos to our oldest emotions and ideas about life and the universe. How are those doubts and confusions to be resolved? What means are there at hand for integrating the old and the new?

2. EVOLUTION OF IDEAS

Though ideas may be imperishable, they are not necessarily changeless. They may and do undergo transformations with the passage of time. The dominant images and symbols, architectures and rituals of peoples and races, which are the representations of ideas, may crumble into dust. They are replaced by other conceptions which prove that the essential ideas behind them have survived. Materializations of ideas undergo mutations in accordance with the needs and compulsions of individuals and groups. They are affected constantly by the vicissitudes of experience and the indoctrinations of education. Ceaseless bombardment feeds them constantly with count-

less perceptions and inchoate impressions. The flux of time has changed the color and form, the heat and energy of the dynamic ideas and governing conceptions of cultures and nations. But throughout and in the end an identity of meaning is maintained. And no matter how manifold have been the needs and purposes for which these patterns of thought have been arranged and recorded, their immortal status has been maintained.

Man's view of himself, in relation to the cosmos, has undergone many revaluations. The vital and enduring creations of individuals and peoples have reflected these changes. What a gallery that would be, an exhibition of all those images and symbols of his life, the products of the cosmic attitudes that have oriented all the different peoples of the earth, from the most primitive to the most recent. Therein would be a history of the human imagination which would be an encyclopedia of humanity's deepest interpretation of its universal experiences. Ideas which have been suppressed, ideas that have never fully come to consciousness, as well as ideas that have obsessed consciousness, all have determined the epochs and events of history. There have been generated strange dreamings in men and even more fantastic searches and struggles motivated by them. Essences and metamorphoses, conflicts and amalgamations of ideas, that have made men so different from the animals and plants around them as to put them in another sphere of being altogether, have dominated their behavior. Above all, ideas about himself and his nature, its lacks and its surpluses, its background and destiny, have moved man as if they were autonomous gods. These have begotten the great figures of the psychic world, as they appear in mythologies and religions, cosmogonies and dramas, folk stories and art construction, conceptions of divinity and humanity that have been overwhelming in their practical effects. For these dominant ideas of peoples have indeed been the creators of their economic and social organs, their tools and machines, codes and ways of life, and the driving forces of their existence.

The survival of ideas in a universal heritage is so vigorous a phenomenon that even when a ritual such as the most ancient practice of sacrificing children to the god Moloch is abolished, the idea continues to live in some form in the psychation of mankind. Animals may have become extinct, but their images in the memory of

our species continue to live on. No matriarchates may now exist, but the conception of the ruling mother can never be erased from the human imagination. Ideas may lose their power to realize themselves or they may become detached from their points of contact with the physico-reality. But in the depth of our psycho-reality they have retained their fixed place. Their sphere of influence may remain latent but may erupt at any time into the concrete behavior of men and change their status from passive and latent to active and urgent.

It is as such a dominant of his consciousness and behavior that man may accept the doctrine of the immortality of ideas, a doctrine with a most ancient intellectual pedigree. To the Greeks ideas were the ultimates of reality because they saw them as the only permanent realities of the psychic world. Impressed by the teachings of Heraclitus concerning the continuous flux of sensations and phenomena, Greek thought, as the protagonist of an order-desiring intelligence, took refuge in the purified representations in consciousness of what things really were or what they might be, stripped of the accidents of immediate perception. These ideas were the eternal models of things and relationships which we call the laws of nature. They were the ideal conceptions of reality, the perfect constructions of rational thought, of which the actualities of experience were merely passing reflections or approximations.

Men may come and men may go, but the idea of man is as stable and persistent as the universe itself. Amid the precarious footholds along the rushing river of the individual consciousness, the stability of these indestructibles of thought provides a haven and sanctuary, a terra firma for the mind. As the nucleus of psycho-reality they provide a solidity that is independent of, and yet sustained by, the elements and activities, the substances and energies of physico-reality.

3. PERSISTENT CREATIVE IDEAS

Ideas, however, are not merely abstractions, cold and immutable as the statues in a museum. Alive and active in mutual influences and associations, they act like organisms within organisms. For the range of their influence extends from the most subtle psychic performances to the crudest biological imperatives of the body. Hence as the supreme motors of good and evil they determine the directions

and ends of all human activity. They enable men to identify everything in their environment, mineral and vegetable, animal and super-animal, and to control the conditions and fate of their own organisms, and thereby dominate their planet.

Far-reaching inventions and discoveries have been originated by the compelling dreams and urges, which have been the long, long thoughts of men and the ceaseless activity of the undying fires in their psychation. Each generation of mankind reveals in the driving conceptions which obsess its thoughts the nature of its ailments and deficiencies and the hopes and goals of its healing and consoling solutions. The philosopher's stone, sought so assiduously by alchemists, was a symbol of the idea of something which could transmute baser metals into gold and silver, in turn an expression of desire to solve the economic problems of debt-burdened individuals and the financial dilemmas of nations. The ubiquity of disease generated the idea of panacea, the universal remedy, by which at a single stroke all the ills to which flesh is heir could be banished, and health could be assured forever. And out of the devastating and melancholy effects of time and the insidious processes of senescence with its degenerative weakness and inevitable doom, the idea of an elixir of life, the potion of rejuvenation and prolongation of life, is born and gathers strength with the passing of centuries. The gross limitations, faults and follies of man stimulate the idea of the superman. Every human lack and every human defect stands revealed by its psychic remedies, the images and ideas of cure which, once formed in the mind, work inexorably toward their fulfillment in practice.

Yet the dominant ideas of mankind, though they may be immortal in their essence and relentless in their pressure for expression, do not appear crystalline-pure. They are inextricably involved with the passions and emotions, the hopes and frustrations that are also dynamically active in every life. And the law of realization of ideas works through a complex of interaction with the forces of the physical world wherein they are enmeshed. A long time may elapse, and there may intervene a zigzag course of progress and retrogression, with halts of obsolescence, before imagination and ideation come into their own. It is through the interplay of experimentation with ideas and techniques of experience that creative concepts finally come to a fruition, which is at once the justification and maturation

of the thought behind them. Thus the philosopher's stone reappears in the laboratory transmutation of elements, the making of lead out of uranium, of nitrogen out of carbon, which can only end with the making of gold and silver out of the base metals. And though Ehrlich failed to find the *magna sterilisans* which would have been the equivalent of panacea, the search for a universal bacteriophage, a something that will consume all the pestiferous bacteria and viruses of infections, continues. The idea of a universal remedy and the search for it is an eternal quest. And as for the rejuvenating elixir of life, there is a continual clamor for the realization of that elusive objective that drove Ponce de León to Florida and Charles Edward Brown-Séquard to glandular extracts.

4. PERSISTENCE OF THE GOD-IDEA

Ideas, then, though indestructible, have their ups and downs of importunity for human beings. No matter how enduring, their phases of interest and emphasis in the currents of human history vary in breadth, length and depth. In the last three hundred years all our conceptions of the universe have come to be tested by the criteria and information of science. The scientific method and its productive techniques have charged with new meaning the possibilities and probabilities of the latent thought-dreams of mankind—such dreams as those of the transmutations of metals and prolongation of youth and life, for instance.

The scientific method of testing the objective validity of concepts by a critical analysis of appertaining experience has made necessary a re-examination of all universal ideas. If they are to survive and flourish, they have now to maintain a certain harmony with the perceptions and logic of scientific research based upon accurate observation and laboratory investigations. Ruthless digging into the meaning of correlated experimental data and skeptical criticism of claimed verifications of ideas have become inescapable imperatives for any modern intelligence. Nowadays it is taken for granted that science has contributed or should contribute to the clarification of every thought that has ever influenced humankind. A consequent re-examination of the basis and dynamics of every belief has followed. Every idea has been subjected to the tests of comparison with the accepted truths of the present-day scientific view of the cosmos. Directly or

indirectly, the scientific method and data have become the sources of the dominant ideas of our age.

Though the enduring conceptions of psycho-reality never die, they fluctuate in their constant or recurrent influence upon human conduct and life as they are considered to be true or false, and hence valuable or valueless. Whether they be considered adequate or faulty carriers of what is accepted as the truth of things determines their vitality in the affairs of mankind. There is a rise and fall in the power of ideas over human beings in accordance with what might be termed their coefficient of effective realization or index of influence. Let it be low and the idea maintains a pale subsistence as a ghost of the realm of fancy or daydreaming. Let it be high and there is manifested a pressure of energy that moves mountains, goes through fire and water, achieves heroic fortitudes and deeds.

Ideas thus live fluctuating existences as regards their power over action. Though never absolutely destroyed, they may be said to undergo obsolescence, hibernation, vegetation, resurrection and reinvigoration. In accordance with the critical effects of time, and the ebb and flow of passionate interest in them, they jut into the foreground of movements and affairs or remain, spore-like, in the background of the cultural matrix harboring them.

Among the most potent contents of human consciousness which have lived through cyclic phases of rise and decline, fall and revival, there has always stood out the idea of a superhuman personality characterized by a creative drive more comprehensive and widely distributed than that of man himself. In various places and in varied languages, there has recurred this idea—the idea of God. Around it has revolved an intuition of a continuity of man and life, life and the cosmos, the cosmos and universal reality. Nothing definite is really known of the origin of such conceptions of a cosmic order. Certain anthropologists speculate that the first gods were ghosts of dead men, of revered fathers or heroes seen in dreams or hallucinations. The god of the tribe was a permanently worshiped ghost. The modern psychoanalysts contend that the idea is a sublimation of the father complex or the authority complex, a personification of the superego. Psychologically considered, the idea of God emerges out of the unconscious as an intuition of tremendous but unknown psychic energies in the universe that are the synthesis and maximation of all the powers it knows.

Through the ages the idea of God has attempted to justify itself to the critical intelligence on the grounds of experience and logic, like other ideas. Metaphysical agnostics have held that as the nature of ultimate reality was unknowable, God as the ultimate reality was unknowable. Others have said that the human brain, because of its inherent limitations as an instrument, can never comprehend the nature of God. Some have rested upon the analogy that we may sense God as dogs sense us and recognize a superiority without actually grasping the differences involved. Such interpretations of the God-Idea have never finally satisfied human beings. And despite every denial nothing stops the questionings or the restless search for a valid answer.

In the past specific forms and definitions of the God-Idea have endeavored to justify themselves to the truth-seeking intelligence by various means. There have been strenuous endeavors to strengthen their appeal by different rational arguments put forward to fortify their reality. Some of these reasonings and rationalizations have essayed to emulate the logic of the mathematicians in compelling the acceptance of their deductions, by defining God in relation to other concepts such as those of causation, perfection, design, idealization, and so on. None of them, however, has succeeded.

Yet men have always felt they could not let their most important beliefs rest upon the mere assurance of faith or revelation. They have become only too aware of the inner disharmony affected by the relegation of their basic ideas to the realm of dogma. They have refused to allow their searchings for an ultimate reality to be limited by the boundaries set by any authority. Each attempt at exploration has endeavored to imbue the conception of God with the compulsive force associated with the acceptance of a mathematical theorem or a logical demonstration. But all dialectical efforts to provide proofs of the existence of God have failed because they have been impossible attempts to deduce, by verbal manipulation, the greatest reality in the universe out of lesser ideas. And so the idea of God has been progressively weakened in its influence over the thoughts and lives of men, as it has faded into a looming shadow, forgotten or denied.

It is an imperative necessity for the soul of man that another approach be evolved. And it is now possible to establish a conscious harmony between ancient emotional traditions and the newer intellectual pride and austerity which the scientific method has pro-

vided. An inductive marshaling of available data can now restore to the idea of God the meaning and energy that once made it the master conception of mankind. There has accumulated much evidence for the reality of God—and it is mighty in its total effect. Testimonies drawn from the archives of modern research can be made to converge into an overwhelming chorus of conviction. Thereby will be revived the tested power of the idea of God over the minds of human beings all over the world, and the world now so disrupted by its absence can be permanently and powerfully united.

The name of God has been taken in vain by many doctrinaires and by many faiths. The God-Idea has been used to entrench despotisms and to inflict cruelties of the most horrible kind, to strengthen superstition and to block the spread of knowledge by fortifying the assertions of ignorance and mystery as divine revelation. Yet this idea remains the most tremendous, the most important, the most unifying conception ever vouchsafed the human mind. Despite the numerous onslaughts to which it has been subjected by skeptical researchers or dogmatic materialisms, the idea of God has lived on under many names and has outlived all assailants. Many have claimed that it is now in its senescence, more vulnerable to attack upon its validity than ever. And others have pronounced over it a fatal prognosis of pernicious anemia, born of a malnutrition and incurable because there is nothing in modern science to feed it. The contrary is the case, and should be so proclaimed by every voice that can be mustered to hear and listen and be convinced. For there are weighty indications and inferences firmly founded in the basic acquisitions of science that charge that idea with a truth, force and significance never before attained. A solidly constructed road may now be built which leads from the individual to God.

In the approaches which have been opened to him in the past, the individual has been lost and dissolved in the universality and eternity of God. But every human being feels in his heart that there must be something wrong, something incredible and utterly unassimilable, in such a conception, and he therefore rejects it. Individuality has significance for the individual, no matter what other values are doubted or denied. It is upon the relation of individual consciousness to God that certain perceptions and insights now throw an illumination never before attained.

1

THE ISOLATION OF INDIVIDUAL CONSCIOUSNESS

EVERY HUMAN BEING LIVES ALONE WITHIN THE CONFINES OF HIS consciousness. No matter how cherished by friends and companions, how sheltered and warmed by lovers and kindred, no matter how rich in appreciation of other human beings, the human soul remains isolated within the circumscribed area of the sensations, thoughts and feelings, the memories and emotions and desires of the present, past and future. No matter how varied and complex are the ties of human association, the individual remains the sole inhabitant of that psychic island which is himself.

The discontinuity of the personal self with all other selves is the essential fact of every human existence. The human individual continually perceives himself as a concentrated entity, a consciousness bounded by the limitations of his own personality, segregated from every other human being. Even in the most intimate fellowship there is a consciousness of those invisible and intangible barriers which permanently divide one individuality from another. Because he lives alone in his consciousness, every man lives alone in the cosmos. This ultimate solitude of every human being is the central fact of all his experience and all his knowledge.

1. SELF AND ENVIRONMENT

To be conscious is first of all to realize oneself as awake, and to be aware of the familiar alien environment. Of this environmental awareness there are different degrees, as all those know who have been introspective spectators of their own emergence from natural sleep or the coma of anesthesia. Under these conditions, outsiders employ certain criteria to attest the presence of consciousness. An anesthetist, for example, watching a patient will report to the operating surgeon that "he is conscious" or that "he is not conscious," by which he means that the patient is or is not behaving as an

adequately tuned-in receiver of stimuli, and that, accordingly, he is or is not among the wakeful responsive living.

Every individual body is indeed like a radio set, receiving and emitting waves of energy, but forever insulated from truly direct contact with their sources. The individual self is as a raft afloat on an ocean, against which beat sensations to which it must react and adapt itself. In the nethermost depths of his psychic life, there is always functioning this perception of the self as the isolated entity. And when its self-awareness becomes saturated with the sense of its inevitable aloneness, a time comes when it emerges into consciousness to voice and lament its loneliness.

These antitheses of self and environment have long been obsessions of human thought. Moreover the two ideas, crystallized out of the stream of consciousness, have come to represent the magnetic poles of psychic life. Each individual's flux of awareness can be formulated in terms of the dominance of one or the other pole in the interplay of interest and behavior. In effect one has been set up against the other, as the tendencies of introversion and extroversion, and a tension obtains between them.

And their opposition is not merely one of the terms of a formula. As a matter of the most immediate urgency the self is forced continually not only to receive stimuli, but to adapt itself to their source, the environment. In the course of such adjustments man's consciousness enlarges or diminishes, strengthens or weakens. In either case the indifference, amiability or hostility of the environment succeeds always in stressing his sense of isolation.

Out of these contrasts of ego and environment, too, have originated the most baffling dilemmas of metaphysics and philosophy, religion and science. All the ego-environment oppositions have furnished endless work for a host of thinkers. The polarities of the objective and the subjective, as contrasted in the tensions of the world and the flesh, nature and human nature, the personality and the universe, have stimulated in every age curiosity and discussion, inquiry and investigation. Many approaches have been employed, varying from the dicta of intuitive revelation to the abstruse studies of rational discipline. No library is sufficiently vast to include all the suggestions and hypotheses—the creations of religion, art and science—that have been proposed as adequate resolutions of the ceaseless ego-environment conflict. Some of our institutionalized ideas bear witness to the survival value of these concepts. Nothing has been closer to the human heart than the warm stream of this deep-

reaching interest, pulsating in the colder ocean of the remotest reaches of human thought. Yet, though religion has dogmatized, philosophy has queried, metaphysics has subtilized, and science has theorized—time has demonstrated them all to be inadequate for the restless skepticism of the human mind.

2. INDIVIDUAL AND UNIVERSE

As an intellectual problem, the relation of the individual human personality to the universe is difficult and baffling enough. No finally satisfactory solution or even a good working hypothesis is at hand. Yet for a great many human beings, for indeed the vast majority, the acceptance of some sort of a solution has been a necessity. So may be explained the survival of all creeds and religions, with their accompanying superstitions. The great masses of the populations of the earth have not questioned the dogmas of their religions; they have had to swallow their ancestral traditions from the great spoon of childhood, eyes shut. It would be impossible for them to live with the skeptical intellectual minorities among them. As for the slightly more cultivated minorities themselves, systems of philosophy and metaphysics have had to supply the demand for some coherent answer to the fundamental inquiries of their souls. But for all of them, stronger even than the intellectual enigmas, there remains the relentless pressure of the emotional quest: the urgent need for the placement of the ego in a relation to the environment that will insure an internal security, a solid ground for thought and action.

No man has achieved satisfaction for the immediate demands of his individual life without some therapy for the pains and wounds of that quest. Though the drive of man's intellect is certainly as charged with power as any of his instincts, it is the latter which exert the strongest compulsions upon his behavior. Men have mobilized a penetrating voltage of energy in their intellectual researches by a fusion of the ancient emotional drives born of instinct with the associated passions of ideas. Yet with all the endless fascination of these researches they have provided no anodyne for the suffering entailed in the final loneliness of the individual.

Stranded within himself, the individual suffers because of something much more penetrating than intellectual instability and insecurity. The question of individual separateness presents itself to his intellect as infinitely complex. Yet despite the seemingly insurmountable difficulties involved, the mind is continuously ambitious to explain this complexity as the problem of all problems. It is the

personal frustration, the bleak inadequacy and the melancholic futility of his endeavors to solve the problem which become concentrated in that emotion of aloneness of the self, so poignant and so recurrent.

The psychic life of the individual seems to itself a simple unity and essence, an entity set apart from all entities. It is reinforced in this conviction because it can watch itself as it swings between intellect and emotion, because it can become the spectator of their achievements and antagonisms. But always it returns in the end to this immediate fact of its ultimate isolation within itself.

The intellect struggles to explain and perhaps to escape the problem with words like integration and reintegration, equilibration and re-equilibration, adaptation and adjustment. It looks for bridges across which it can reach others, cables of communication across the seas of durations and occurrences in which it is immersed. At long last it must admit to itself that it has only been traveling in a circle, returning inevitably to itself in the end, because all its devices of analysis and synthesis cannot change the basic fact that the individual consciousness is forever fenced, itself the fence and the enclosure.

Furthermore man learns, through his intellect, that consciousness has been evolved biologically to meet new experiences, to prepare for action, to register the significances of stimuli. Manifestly it works to preserve the individual against the threatening elements in his surroundings. Along the long road of its pilgrimage the conscious self pursues its way, restoring and maintaining a balance and unity of itself against the forces of disruption and dissolution operating either within or without its enclosure. Yet this same consciousness, useful and indispensable to the individual, can turn and rend itself. Finished with its work of task or pleasure, the sense of its aloneness returns.

Now there is no doubt of the paramount importance of the specific activity of consciousness which responds as the integrator and coordinator of the living individual. Without this integration of the self as a whole, which persists even in sleep, all the billions of cells of the body fall apart, in the face of challenging situations, like bricks without mortar. All the countless reflexes, habits and attitudes would become a jumble of fragments like the pieces of a puzzle suddenly disintegrated into a meaningless heap.

3. THE STRUGGLE TO ESCAPE ISOLATION

Immense as is this service that the sense of the self as a whole renders in the maintenance of a necessary unity for the individual, its inevitable concomitant has been an emphasis on the fixed barriers and

boundaries within which man's ego must be forever confined. For it brings out his inescapable separateness from the rest of reality, and the hopelessly incurable quality of the resulting solitude-sickness of his soul. Slowly and painfully men have struggled to achieve a degree of escape into reunion with their fellow beings through the communications of language and art, work and play. Yet few achieve any real release from the imprisonment of the self within the walls of consciousness.

For words and communications divide individuals more often than they unite them. It is when he is confronted by the recurrent failures of his attempts to liberate himself that the individual's sense of bafflement becomes keenest. It drives him back into himself, into the most chronic of the ills to which he is subject, into the most irremediable of his despairs.

It is indeed when consciousness is burning most brightly, in pleasure or in pain, in love or in hate, in states of intense fear or suffering, in victory or defeat, even in the most exquisite moments of emotional ecstasy or triumphant domination, that the feeling of isolation most poignantly sways the individual. In states of superiority and inferiority—though more often in the latter, and especially when the danger of the complete obliteration of consciousness threatens—the sense of complete isolation, of the infinite loneliness of the soul, comes again to pierce him. In this persistent homesickness within his own homeland, man feels himself lost in a far and foreign country.

Many are the varieties of escape essayed in an effort to assuage that deep-lying pain. Many times in every human life, the individual sees himself sentenced forever to solitary confinement with only the bread and water of inadequate language and ineffective gesture as food to stay the hunger for release. When not narcotized by the anodyne of restless self-forgetting activity, that sense of the isolated self in a prison from which it cannot ever be extricated and its accompanying melancholia of futility returns again and again. It can vivisection man's consciousness with the most torturing of instruments. So he may take to alcohol or drugs or strange perversions to evade the suffering it causes.

The frequency with which this suffering born of isolation recurs, depends to a certain degree upon bodily states, conditions of the brain and nervous system. Particularly in fatigue or whenever vitality is lowered it attains its maximum intensity. There is probably some definite law of association between its appearance and the impulse toward suicide as its pathological expression. For it is in disturbances

of health, that the polarity of ego and nonego, of self and the environment, injects itself most deeply into consciousness. It is then that the most heedless of extroverts may realize, with a shock of sudden awareness, how secretly alone he is upon the tiny drifting canoe of consciousness careering down the vast rushing rapids of time and space.

In no aspect of human thought is the contrast between the intellectual attitude toward a problem and the emotional more striking. In theory, the intellectual solution of the problem of his isolated consciousness is attainable for the individual even though it may be powerless to comfort the deep distresses of his lonely soul. During the intellectual research, while reason is endeavoring to force its way through the maze of perceptions and inferences to the truth, any emotional distraction is a hindrance and suppressed. But after all the work of the intellect, the individual must return to this problem of problems, the stark separateness of every self, and seek some sort of therapy for the anguish and even terror of the recurrent perception.

4. SELF, BODY AND MIND

To a scientific consciousness, body and mind are fused and unified in the concept of personality. That the body and mind are somehow one, although we cannot completely understand the mechanism of that unity, is a view which has so overwhelming a weight of evidence and logic in its favor that every other theory of their relationship has become untenable and obsolete. That unification, however, adds to the mystery of the problem. For it renders both the functions of the body and the workings of the mind parts of the environment of the observing self. Hence they too can be experienced, at certain odd times, as strange aliens which complicate life for the self and add their quota to the sense of ineluctable isolation.

Nothing is stranger than this dissociation of body and mind from the self. From that vantage point the self can look upon these component parts of a human being with the cool detachment of an astronomer taking the temperature of a star or ascertaining the chemical composition of a comet. The individual can abstract and detach from his individuality all the organs of his body and all the functions of his mind.

The ego, as the source of personal self-awareness—as the consciousness of self—is the center and focus of all experience. It incorporates the resultants of mental activities as well as of the reports of the bodily organs. Its cohesive activity binds them together into a web of interdependent components—an integrated unity. But it still keeps

its sense of proprietorial separateness. It speaks of "my body," my hands, my eyes, or "my mind," my thought, my will, instead of "this body" or "this mind."

Some have contended that the ego has no real existence, that it is just an imaginary line of reference for psychic geographers. That contention is a good example of the absurdities to which purely objective logic, divorced from self-conscious experience, may lead. The individual perceives himself as a whole, feels himself as a whole, moves and acts as a whole. The ego is the concentrated and intimate sense of chieftainship of this wholeness. It includes, at the same time, a perception of being completely alone. Even though the sense of "wholeness" may leave him, his ego survives, even as the captain of a sinking ship or the general of a routed army survive.

For there is no experience more real and more convincing of the underlying unity of the self, than that sense of being one, and only one, a consciousness which comes to every human being during the course of a lifetime. In every happening and adventure, two sides of psycho-reality face each other. The ego may regard all the rest of the self as simply its appendage. Or the self may look upon the ego as only an aspect of the flux of its activities. Ego and self may alternate their positions as foreground and background of consciousness. But in the end the isolation of consciousness from its own body as well as from the alien environment, becomes the fact with the most significance for the individual, especially at the most important moments of his existence.

When, at times, his isolation comes to possess its most cutting edge, the individual feels himself totally segregated from all the universe, as well as from any of his own kind. The smoldering fire of his consciousness is like a solitary auto-da-fé in a blackness upon which he is slowly burning, approaching nearer and nearer to nothingness. When he emerges from that experience to return to the warm contacts of his fellowbeings and the anodynes of recurrent pleasures and tasks, the recollection of that supreme experience remains to haunt him. Forever coloring his memory, it motivates much of its conduct, so that doctrines and techniques to elude that searing of his consciousness become paramount powers in his history.

As awareness of the isolation of his life becomes sharpened for the individual it brings with it increased perception of the impermanent quality of much that occupies consciousness. That fundamental perception add its bitterness to the desolating emotion. From childhood to manhood, as the different umbilical cords become severed, from

mother and father, from blind acceptances of authority and the pressures of the circumambient culture, the individual becomes more and more defined in all his separateness. At last the ego itself stands apart, to look upon even the body with wonder, upon that ruthless body that sinned the sins unforgivable and to look with regret upon that limited mind that committed so many irretrievable errors.

5. THE LONG JOURNEY

All these words, body and mind, self and spirit, flesh and soul, merely enhance the tortuosities of the maze within which the individual finds himself alone and running to find some unknown egress. Consciousness has been objectively located in a definite portion of the brain, which has a special arterial supply. This cerebral center is fed with material for the preservation of consciousness by the blood. The basal ganglia, those most ancient nerve networks at the base of the brain contribute the centers of the instincts, the emotions and affections. In closest association with them are linked those areas of the brain in which the senses meet the instincts, to confer the bouquet of pleasure or pain, like or dislike upon experience. Then there are the complex systems involved with the concentration and liberation of impulses of excitation or inhibition, in the great hemispheres of gray matter, where the psycho-reality of ideas and concepts is elaborated. These different centers of the brain are charged with energies by the chemical effects of the secretions of the endocrine glands. The involuntary currents of the sympathetic nervous system flow ceaselessly through all of them. An amazing interlocking of substances, energies and structures forms the pattern of the physical basis of consciousness.

The contributors to consciousness are many and complex, the countless rivulets and tributaries of streams that merge together into the great river of the self. Yet, by the most curious of all alchemies, the ego, as self-consciousness, perceives itself as one, apart from all these components, inspects itself as one, criticizes itself as one and idealizes itself as one. Informed of the netted intricacies of structure and chemistry behind his single sense of himself the individual can only wonder at the marvels of the process by which he is strapped and bound to himself.

For to the isolated consciousness, no revelation of the carnal marvels of its creation can make any difference to the poignancy of being fettered and shackled in the strange island of itself, all the more inescapable in being at once formed and bounded, yet reaching out into the boundless, unbordered, unformed ocean that surrounds it.

To know that we are contrived of electrons and protons, hormones and ferments, substances and catalysts, only augments the mystery of the homogeneous feeling of the "I." As a concentrate of its own psycho-reality, consciousness is an entity by itself, no matter how involved it is with the world of matter and the world of energy which constitute the universe of physics and chemistry. That feeling is determined by the circumscriptions and limitations of consciousness. It is the primary of all immediately given knowledge. Also, the presence of a similar feeling and a similar consciousness of isolation in the millions of the other human beings around it is a prime of its knowledge.

The existence of consciousness, varying from the dim to the glowing, in all living creatures is demonstrated by several indicators used by ourselves in testing its functioning. It is possible, indeed, to discriminate grades and degrees of consciousness in the same animal at different times as in human beings themselves. Among the latter there is a range all the way from idiot to genius, from introvert to extrovert, from the fully awakened to the completely asleep, from the refreshingly alive to the comatose drugged. A consciousness that is rich in emotion, saturated with feeling, opulent in thought may be distinguished from one in which emotion is poor, feeling diluted and thought impoverished. There is undoubtedly evidenced a spectrum of intensity of psycho-activity in different living individuals, that is to say of an activity which has the earmarks or diagnostic criteria of what we call the psychic as contrasted with the nonpsychic.

6. THE CONSEQUENCES OF ISOLATION

The narrowing sense of self as an apartness from others is generated slowly as the newborn babe turns into the child, and becomes more and more marked until the individuation of adolescence. A child feels alone in the dark, or when separated from its mother or whomever else it can fly to for protection when taken by fear. After a time comes the genesis of the infant's sense of its own identity, with the accompanying distinction of mine and thine. On the basis of the subsequent evolution of its social or antisocial attitudes, there develops a consciousness, first of the separation of its body and then of the isolation of its soul.

It is as its emotional life develops along the lines of inherited physiological patterns that the child gradually realizes the internment of its ego. The inescapable frustrations that are its lot and the inevitable penalizations through pain of one kind or another drive home

the fact of isolation. The experiences of childhood do not, at the beginning, present themselves as the specific qualities or attributes of distinct things, such as the analytical adult intelligence selects for its purposes. Consequently the learning of that isolation is one of separation of the self out of the organic continuum in which he has felt himself rooted.

The child never sees the trees before the forest, but rather takes in all of its experience as a single block of its life. To it the trees of the forest are like the leaves of the tree, participant parts of a pattern all cohering by some inner unity of substance and form. Out of this primary monism of perception, its psychic differentiations proceed in a series of phases. In the first phase the environment is all one blooming complex of kaleidoscopic integration of events with certain figures emerging as the centers of desire and satisfaction out of a background of shifting relations. In the second phase, the self is realized as a complex of distinct but interwoven parts, wholly concretely, without reference to any permanent significance. And in the third the analytic intelligence begins to distinguish the permanent cores in changing things for which names are learned. It is then that there are perceived causes and conditions in which the self is recognized as an entity with its outlines defined under the sharpened focus of experience. The configurations of reality come to constitute a pattern with the ego as the fixed center. The full appreciation of the self as an island of consciousness becomes dominant.

The emergence of the ego in a child is first evidenced in its sudden perception of its dependence upon its parents—their care on the one hand and the fact that they hamper and prohibit its activities on the other—and the dawning consciousness of sex. Feeling itself weak and repressed, the beginnings of isolation are rooted in the suffering of self-denial. Quasi-sexual activities in the first years of its life add a nucleus of self-hoarded voluptuous sensations which are added to the subconscious selfishness of the nursing period. Before more conscious sexual activity appears, the currents of self-discovery and self-manipulation—the learning of itself, the knowing of itself—coalesce into the formation of a well-defined ego. So much of the pleasure seeking, pain avoiding self becomes part of the unconscious psychic life of the individual and is accompanied by the genesis of a feeling of guilt, the guilt of isolation.

Thus is germinated in every human being the consciousness of the immutable contrasts between his own ego and that of the other. Out of a compounding of pain and pleasure, guilt and resentment, the

isolation of the individual consciousness crystallizes as the elementary condition of his existence. The narcissism of the child effects the segregation of its individuality out of the matrix of parts and relationships with which at first it identified itself completely and unreservedly. Then with its education in the laws and prohibitions and models of the moral code—the rules of society and the superego—its sense of aloneness gradually comes to dominate its private emotions. In the end the ego, as the socially oriented individual consciousness, comes to stand continually on guard against the standards and norms and goals imposed on it as compulsions of conformity. Inferiority, weakness, secrecy, guilt all combine in its intellectual and emotional growth to produce in the most fully evolved personalities the keenest sense of profound isolation.

Out of an original identification of the self with the universe the child of civilization arrives at the years of maturity as a jostled wanderer in a jungle of aliens and antagonists. In addition to the fact of its own physical separateness, the whole impact of the complexities of the environment tends to concentrate and fortify his isolation. There results a vicious and ironic tendency toward the preservation of the very state the individual would escape.

Human consciousness knows, both by observation and by reason, that it is not exclusively alone in the universe. For the individual is sure of the coexistence and co-presence of billions of other bits of consciousness, other islands of psychic life in the world about him. And human intelligence may discover a universal distribution of such mites of psychic separateness. But this provides no real consolation for the suffering of isolation. Indeed, such knowledge can only tip the arrow with poison. There can be no curative release from the melancholy of man's solitude and his sense of futility inextricably interwoven with it, in the perception that the distribution of consciousness is universal.

It may be contended that the normal, healthy, socially conscious human being does not concern himself much with this matter of inherent detachment from other forms of consciousness. And it is true that the sense of incurable self-confinement is no constant companion of the conscious life of the healthy, normal individual. Nevertheless there can be no doubt that there is always at work within him an unconscious realization of the fact which unveils itself in much of the ugliest and most tragic manifestations of human nature, as well as in the most sublime and moving productions of its creative powers.

A certain distinction may be made between a sense of the privacy

of consciousness and the suffering of isolation. But the two are really inseparable, for privacy is involuntary to begin with, forced upon the individual as an inescapable condition of his psychic life from his earliest years. And from this compelled privacy stem all the evils and pains of isolation.

The inescapable solitary status of consciousness forces upon the individual the primary instinct of self-preservation. The preservation of this separate consciousness of his own as an integrated whole, the satisfaction of the demands of his personal needs in relation to the opportunities and dangers of the environment, become the paramount interest of his psychation. To these are added the effects of social and moral pressures, inhibitions and intimidations of his fellow human beings, either singly or in a group. Thus he is prevented from freely communicating with others by the fear of one or another kind of condemnation or misunderstanding, or being thought foolish or inferior. In the resultant contraction of the self within itself is presented the fundamental explanation for most of those evils of human nature which depress all observers.

Secrecy of feeling, the strategy of self-interest, the private scheming of greed and possessiveness, the perpetual seeking of self-advantage, all the twistings and turnings of personal opportunism, the concealed meanness of the self-centered careerist and the surreptitious baseness of the criminal, the mental reservations of selfishness among the most illustrious of men as well as the lowest, are the inevitable consequences of the fact that the isolation of consciousness is accepted by the self as its most basic characteristic. All the personal values of success and failure originate from the same source. It is not only in the petty strivings and efforts of the individual life that the retreat of the ego is so evident. In all the devices of self-defense and in all the mechanisms of offense by which man preys upon man, the consequences of the same law of isolation emerge into view.

The difficulties of transmuting the contents of individual consciousness, either as thought, feeling or impulse, into language, materially assist the treachery and deceit and disloyalty that fill the pages of human history. To that underlying conviction of the ego that it is forever on its own we owe the worst evils of life. Whether he knows it or not, whether he acknowledges it or not, every human being shows in his daily behavior, as well as in his inner musings, that he feels the weight of his personality shut within himself. Behind the impenetrable barriers, sensations and emotions, ideas and moods, interests and decisions, the self moves along its secret way apart from

all else, a way that twists and turns along its devious, competitive course.

In the darkest hours of night, the most occupied of men, even the happiest of mortals, is sometimes compelled to look into the depths of his self. In meditation of his most intimate thoughts and private plannings he may review that internment of his self. Then perhaps he sees that at best he is only a transitory traveler in the outer world. Its sights and particularities he is allowed to visit only because he is equipped with the necessary passports for passage and participation. But he must return inexorably to the world of feeling, thinking, understanding, remembering and evaluating, the unique psycho-reality within.

Even the loudest of pure extroverts is sometimes thus driven in upon himself into the empty chambers of his consciousness, to envisage the long road he is traveling, an unaccompanied figure of eternal pathos. For the introvert the state of being stranded upon his inner island is somewhat assuaged by his familiarity with it. But because the extrovert has sometimes achieved the illusion of escape, its realization is like an explosion during dreamless sleep for him.

At some time of every life, whether because of illness, frustration, brooding melancholy, harrowing grief, or unrequited love, the individual is thrown back upon the fundamental aloneness of his personal life. That fundamental fact is then drilled into every individual consciousness. Even for lover and beloved, husband and wife, brother and sister, mother and child, the irremediable demarcation of one individual from the other, as sharp and definite as the bodily differences, becomes the cruelest fact of life. The human being then stands revealed as possessed by an inexhaustible fear of injury or destruction of his private self. And how he spends himself pursuing futile evasions of his problem in satisfactions that can be only passing because after them he must inevitably retreat into himself. His most tremendous efforts are contaminated with the endless vanities and posturings of the self, as he tries to escape from the unbreakable bars of the narrow room in which his soul is doomed to function. Sensitive human beings feel in addition the suffering they cause as a result of their isolation.

7. MAN ALONE IN THE UNIVERSE

Man is not only alone in himself, as an individual, he is alone as a species. Through the windows of the strait quarters of his soul he views the universe that has been constructed for him by practitioners

of the scientific method. He must look out upon the cosmos outside himself and see it as a cold and empty abyss of space lighted only by the flickering incandescence of star gases. Science also teaches him that the life, out of which he came, began at a measurable point in the past, an accident in drying matter, flung off from one of many masses, the swirling sun star. Man is told that, some billion years ago, lightning flashed, a bolt of electricity charged down and behold, something stirred. And out of that mess of nitrogen and oxygen, hydrogen and carbon, an unstable mixture of unquenchable discontents and imperfect satisfactions, living matter as protoplasm, appeared. In pain it breathed the surrounding atmosphere, in pain it hungered and ate, and in pain it grew and reproduced, in pain it was dissolved into the omnipresent dust. Pain, the sign of incompleteness and separateness, has been the refrain of its existence.

This pain-driven protoplasm, science teaches, varied its substance, strove and learned to deal with its enemies: cold, starvation, attack. It made itself into plants and insects, corals and sponges, worms and fish, reptiles and birds, beasts and man. Because of these very throes of pain and suffering, under the driving lash of a consciousness that cries out to survive, all its creations came to prey upon another, to consume one another, to fabricate tooth and talon to tear the means of subsistence from others, or to poison and injure, in fearful multitudes and variety. The pain born of individuated protoplasm breeds a war of extermination. It has been called the struggle for the survival of the fittest, mitigated only by the necessities of mutual aid and co-operation.

So though aloneness of the individual appears to be an inherent condition of human personality, the dominant fact of his existence, he is not alone in the sense of a Robinson Crusoe on an island without even a man Friday. Rather does the human being feel himself forlorn and lost the more because there are so many other Crusoes and Fridays, each wandering about in his own tethered circle of ideas and emotions, bound within the circumference of his ego. The varieties of individuality accentuate the subtle curtain that veils each particular center of human consciousness from the others.

For there is no more amazing spectacle than the shapes and kinds of insulated psychic life that move around private axes of feeling, awareness and desire in the world of humanity. Each is in itself a smoldering or brightly burning center of protoplasm and psychation, self-contained and self-limited to the end, and yet a member of some whole, of a family, a group, a society, a people, a species. They are all so oddly different in the contents of their consciousness. Taking in

the entire range of human life—from the grossest manifestation, of the animal appetites of hunger and sex, to the most soaring flights of the mind—they include a parade of infinite variety and interest. Their gestures and articulations, their attitudes and their habits include a repertoire of variation that no classification of types could ever completely encompass.

But one possession they have in common, one common denominator: consciousness of self and consciousness of the other. Here I am and there is he. Upon this double awareness is built the whole stupendous structure of the reactions of the self—the complexes of attraction and repulsion, choice and preference, competition and rivalry, domination and submission, exchange and exploitation.

8. THE WAY OUT

The most urgent problem for each individual is the breaking of the vicious circle of isolation in which he feels himself revolving. In his innermost heart each one of us longs to snap the chains which have wrought themselves out of his individuation. Is there any way out of this apparently inescapable fate of the individual locked in the vault of his consciousness until the end of his time?

For centuries, indeed millennia, mankind has, under various disguises and aliases, created a thought pattern out of such ingredient ideas as original sin, redemption and salvation. The medieval hermit seeking union with God was convinced of his damnation as a single self. The modern poet, bewailing in lugubrious verses, his isolation, the sad fact that he and his beloved are forever separated as two selves by the glass partition that divides their cages, may never have heard of the Confessions of Augustine or may dismiss him with contempt. But there is an analogy surely between their plights. The situation faced by each, each in his own day and expressed in his own terms, is common to humanity.

The isolation of the individual consciousness is a perpetual dilemma of mankind, and the idea of it, and ideas as to how to relieve it, have a recurrent, an everlasting vitality. The saints long for redemption, for salvation, for a God to save them. The longing of the skeptic is no less poignant because he has no accepted term for its object, and when no clear idea appears to fulfill the objective of a yearning, the idea of nothingness, empty and chaotic though it be, must take its place, which, at its extreme, is the idea of suicide. This in Charles Morgan's novel is Sparkenbroke's redemption, and the only course he can envisage when the burden of an isolated existence overcomes

him. Suicide is the last refuge of him who is completely devastated by his isolation. As a means of release from isolation, it becomes the supreme sin, the false road to redemption. Despite the discrepancies, an identical configuration of ideas prevailed in the ancient world as in ours. Original sin is one way of phrasing the sense of isolation, isolation that is unalleviable, inevitable, natural to man, of his very essence. The search for salvation can be discovered in poetry, in fiction, in the confessions of friends and intimates, in the revelations of seers and mystics. But it will take more than intimations of continuity to rid the individual of the conviction of discontinuity by which he has been haunted. Yet the belief in the isolation and discontinuity of the individual is an illusion, for he is one with all the living and indeed all things.

The walls of isolation turn out to be of the flimsiest construction when subjected to the powerful searchlight of knowledge of relationships that modern science can furnish, the very same science which has apparently reinforced it. A network of material and psychic connections exists among all human beings, in fact among all the living. A multitude of evidence of a continuity, like that of finger and hand, discloses a continuum of kinship that includes the farthest reaches of the cosmos. It is as if the reagents of science, applied to the pages of reality, revealed what had been written in invisible ink of the real relationship between human beings and the unity of the universe.

Individuals seek to escape from their atmosphere of aloneness, with every possible device. There is mitigation of it for some in the kin sympathy of their own kind. But no one can ever lose the tragic sense of isolation until he has learned how intimately he is bound to all of his kind as well as to the cosmos. Either by a direct mystic revelation or by a realization based upon a synthesis of available knowledge and experience, he must come to see his direct continuity with all of the living achieved by the genetic process which identifies him with all that has preceded him in the history of the cosmos. It is possible to make him, through the new insights derived from science, aware that his isolation is a superficial representation of an aspect of his nature. When man comes to behold himself as part of a greater reality, as a member of an organism which includes him in a personality which is not unlike himself, as he will when he comes to know all the facts and their significance, the illusion will be corrected, and a different balance and harmony will be introduced into the whole tempo and pattern of his life, as well as into the life of mankind as a whole.

2

THE CONTINUITY OF THE LIFE PERSONALITY

FROM THEIR EARLIEST YEARS HUMAN BEINGS BECOME ACCUSTOMED TO the conception that they are made of the same substance as those with whom their first emotional relationships have developed, fathers and mothers, sisters and brothers. A man's resemblance to his relatives convinces him of a certain sameness in their composition. The resemblance, he learns, is dependent upon the reproduction of a family stuff which links its generations. That there exists a physical continuity between himself and them becomes one of the unquestioned fundamentals of his beliefs.

Language assists to confirm him in this impression. The psychic intercourse of the family diminishes considerably the feeling of physical separateness. Primitive peoples, tracing their ancestry to some animal, totem, or god persuade themselves that there is an actual physical basis for tribal consciousness. Then there is the universal story of a primeval pair of parents of the human race, a tradition which makes all men blood relatives.

1. THE FACT OF PROTOPLASMIC CONTINUITY

When Charles Darwin's *Origin of Species* in 1859 destroyed the doctrine of the special creation of species, he made impossible a belief in the absolutely distinctive nature of the different varieties of animals and plants. He established that there is a definite unity of substances and pattern among all living beings. There is no doubt that a certain vague preshadowing of this conception existed among some of the Greek philosophers, and it was suspected by famous pioneers among the biologists who preceded Darwin such as Buffon and Lamarck. But an assured acceptance of this fact was impossible before two other basic facts were established. The first was the discovery, in the beginning of the nineteenth century, of protoplasm, the physical basis of life, and its distribution throughout the living world

in the form of cells. Secondly it was necessary to perceive the similarities in the embryos of different animals, including the human, and thus to substantiate the conception that there is a general progress of species from lower, preceding, less organized forms to higher, more organized, subsequent, forms.

Embryologists found that the more recently appearing animals recapitulated in the course of their development the structures of less complex tissues and organs, once useful in preceding animals but now long become useless. Gill clefts reminiscent of the structure of a fish, are found, for example, in the neck of the developing chick in the egg. In the light of such discoveries, the idea of a continuity of substance and descent from one form to another, that is, the idea of evolution, was irresistibly suggested.

The discovery prepared the way for the evidence of such continuity from paleontology, the mute testimony of the bones of obsolete species as they were successively layered in the strata of soil and rock, the skeletons and remains of successive generations. These inferences were reinforced by the observed distribution of living species in local areas which showed many resemblances between different forms, similar to those exhibited by members of a family. After Darwin it could no longer be doubted that existing animals and plants were derived from predecessors who were simpler and different and yet ancestral to their later descendants. Also that in the last analysis all of them could ultimately be traced to a simple, original undifferentiated life stuff: protoplasm.

Darwin converted the world of science to a belief in the direct continuity in time of the different forms of life. Thereafter it was generally accepted that there are genealogical lines of association which hold together all the material manifestations of life.

But his theory of natural selection, with its emphasis upon an incessant struggle for existence between separate individuals and species, ignored the issue of any possible psychic continuity of life. To the accompanying possibility of an uninterrupted flow of mind in protoplasm paralleling the continuity of matter in the living he seemed blind. And he blinded most of his successors to the continuity of psychic life as well as of the physical in the long chain of events involved in the evolution of living beings. Yet there is much far-reaching evidence of the presence of such a psychic continuity.

To begin with, no one can deny there is an inseparable union of mind and matter in protoplasm. No one knows what matter is nor what mind is, but they are always mixed in living matter. Protoplasm

is always compounded of psychic characteristics as well as physical properties. It would seem that there must be a continuous modification of the psychic in the evolution of any species as well as of the material though the latter can be more easily observed. The psychic links between species as between individuals are less obvious, less visible than the material ones. By necessity they must be inferred from the total data of the history of life. The evidence of evolution which has been unearthed by the indefatigable curiosity of generations of biologists is in favor of the activity of both.

2. THE GENEALOGY OF LIFE

The idea of a material evolution of life forms, through a series of graded variations, was a triumphant achievement. Before its appearance there had been only vague speculation, myth and dogma concerning the origin of the various species of our earth. Thus when a scientific genealogy of animals and plants replaced the dogmatism of authority or revelation concerning them, a tremendous discovery—the unity of life—was disclosed in a flash of realization.

Darwin's major problem was to make probable a genealogical continuity of the more recently appearing generations of living creatures with those of extinct species, in each of the periods of the earth's history. Here the geologists came to his assistance with a great deal of valuable information. As had been suspected by Leonardo da Vinci but was first demonstrated by William Smith, English land surveyor and canal builder of the eighteenth century, the earth's surface is no uniform stretch of soil and rock. It is composed of layer upon layer of materials of different chemical composition. These strata, such as the carboniferous, coal-containing stratum, the cretaceous, chalk-bearing, the red sandstone and so on, occur more or less regularly at different levels. That each of the layers was once the top of the earth, is demonstrated by the presence of bones of the various creatures who inhabited it at each discoverable period of its history.

Fossils evidence gradual modifications of the body structure and ways of living which lead one irresistibly to the conclusion that the species and forms of one layer gave rise, through variation and adaptation, to the forms found in the stratum above, and so on in turn, until we come to those of the very topmost. Nor did all those in the lower layers become completely extinct or obsolete. For, if adapted to their environment, they continued to survive as the older stock all through the ages, living side by side with the newer pioneer and

parvenu species derived from them. All suggest a genealogy of life which is like that of the trunk and branches of a tree, the Tree of Life.

Among the vertebrates, the age of fish begot an age of amphibians, who lived upon land and in water alternately, creatures like the frogs and toads. Later, out of the amphibians came the great reptilians which in their turn begot the birds and mammals. And, going backwards along a series of replacements and continuations in the history of the species, out of one great stretch of time into the next, the story leads back to the dim beginnings of the forms of life which existed before the vertebrates, forms like the protozoa and protophyta, the bacteria and viruses, which have left no traces at all of their origins. Being without bone, no vestige of them could remain. But we can be sure of their existence because of their persistence to the present day.

Thus, though they have wandered and changed in their appearance and manners, the youngest sons of life are of the same substance as the eldest. Certain families of a species are more closely related than others. Such close kinship can be demonstrated by simple blood tests on apes and human beings which prove a degree of consanguinity not obtaining between cats and dogs, for instance. There is a basic chemical similarity between the fundamental substance, the protoplasm of all living things. And the nearer they are to one another in blood—like that of brothers as compared with second cousins—the greater the degree of chemical resemblance in the constitution of the blood, which reflects the degree of kinship of their respective protoplasms. While none of these has been thoroughly worked out by any means, there is enough evidence to establish the principle.

The fossils, the rock-entombed ancestors of all the living, bear their epitaphs, the dates of their coming and going, in the physical and chemical constitution of their remains. These hieroglyphics tell the tale of the progressive modifications of an underlying design, driving persistently toward a pattern which expresses the fundamental needs and requirements of the living substance. Organs are developed which become more and more efficient for feeling and moving, seeing and hearing, smelling and tasting, excreting and reproducing. Tissues of offense and defense are evolved. A system of co-ordination of all these, a brain and nervous system, becomes more and more and more complicated and efficient.

A central theme of the individual against the environment becomes more and more sharply developed with various fugues and variations. In the course of this development appear most curious and diverse modifications of structure and functions. There occurs an extinction

of certain dominant chords and their replacement by others. The record of the genealogy of life reconstructed in its extinct representatives is now entirely convincing. There is testimony of the existence of a definitely traceable line of descent from the living of the past to the living of the present, as reasonably complete as is the evidence of the continuity of form and expression in the inscriptions and tablets, the papyri and sculptured ruins of Egypt and Greece and the illuminated manuscripts of Florence and Rome, with the printings and writings of our own time.

Life begets life, not with the merely repetitious note of a linotype machine grinding out duplicates, but with variations and modifications that change one species into another. A driving energy forces the evolutionary movement onward and upward in spite of the manifold hostilities of environment. Of that much the geological record assures us. Though it is a history of which the few surviving yellowed pages are faded, mutilated, and inscribed in confusing language, the story has been made clear. The plot of the narrative, and the threads of the plot, have been definitely read in general outline. There can be no denying that all the amazing and countless variety and diversity of species and individuals, alive or dead, are but the incidents and scenes of a tremendous epic relating the adventures of one central personality, life, engaged in a titanic struggle with its mother, earth, and its father, the cosmos.

3. PSYCHIC CONTINUITY OF THE LIFE FORMS

There can be no doubt of a remarkable similarity of substance and general plan among the different species of living things which cannot be accounted for, save by the hypothesis of a common descent from a single ancestor. Yet this similarity and continuity might be explained upon purely chemical grounds. There is admittedly a chemical identity or quasi-identity among all the living, and perhaps there is nothing more than this chemical and physical kinship. But that is not evidence of a psychic continuity of the living.

One may simply ask: Must the concept of evolutionary continuity be limited to the purely physical and chemical? Then the isolation of the individual consciousness would remain an undisputed fact. For if the relationship of species and species, individual and individual, is purely chemical and only physical, the life of the individual psyche is truly forever barricaded from that of every other.

There is a chemical compound of carbon known as benzene, consisting of six carbon atoms arranged in the form of a ring, the benzene

ring. Nature and man as synthetic chemists have created hundreds of thousands of chemical compounds which are known as benzene derivatives, because they are constructed out of the benzene ring, a pattern of carbon and hydrogen atoms linked together in a circuit. This ring serves as a nucleus, which can be modified by the addition of different chemical elements at different places in the ring.

By multiplication and substitution of different rings, the hundreds of thousands of carbon compounds form a family tree, since they have all originated in the trunclal or root substance, the nucleus of the original benzene. They all have certain physical and chemical properties in common because they are all benzene derivatives and therefore chemical relatives. The nearer they are in chemical composition, in the nature of what has been added to or substituted for the constituents of the benzene ring, the more closely related they are and the more similar in their chemical and physical properties.

The relationships of the known different species and individuals of the living world to the original simplicity of the primitive protoplasm may be of a similar nature. According to a merely chemical view, the manifestations of evolution are entirely evidences of the complication and mutation of the original chemical nucleus. Those existing later in time would be naturally derived, or, as we say, descended or evolved, from those previously existing. Those simpler in the chemical constitution would therefore be less developed and less adapted to a complex environment. Variations would simply be mutations of the chemical formula of the germ plasm, with effects similar to those produced by the synthetic chemist who modifies his benzene and aniline derivatives at will by introducing nitrogen or oxygen, sulphur or phosphorus, iron or iodine into his compounds.

The synthetic chemist indeed might be compared to the animal breeder. He selects for perpetuation the species of carbon compounds he creates as he considers them useful or desirable. Others he destroys or allows to remain unmultiplied. Those which he selects as interesting or valuable continue, at his hands, to interbreed or interact, to see what new substances or varieties of species may be evolved further.

From this point of view, therefore, it is logical to say that all the great kingdom of benzene derivatives, because they are undoubtedly members of one family, are constructed of one reproduced underlying substance. There is just as much of a solidarity and continuity among the derivatives of that substance as there is of continuity and solidarity of the first germ plasm among all living things. The biological continuity of the germ plasm becomes then a phrase to suggest that the

resemblances between parent and offspring, between brothers and sisters, are due to repetitions of the same underlying chemical formula. It could be applied just as legitimately and logically to the resemblances of one lot of indigo made on Monday to one made on the succeeding Tuesday due to the similarity of their chemical constitution.

There is thus an ambiguity about an appeal to the merely physical and chemical resemblances only, or in other words to the material relationships between individuals, as a basis for the recognition of the underlying continuity of living or extinct species with their predecessors, no matter how different in appearance. The essence of the doctrine of evolution consists in the establishment of the organic continuity and unity of the whole series of animals and plants which definitely distinguishes them as a group of the living as opposed to the inorganic nonliving. There must be another principle that holds them together in an interlocking chain of kinships and similarities. That is the principle of their psychic continuity, a continuity of the details and trends of their psychic life, a continuity of their psychoplasm, which is conjoined with the continuity of their protoplasm or germ plasm, much as the flame of a candle is constantly associated with its wax.

Interpreters like Huxley, as well as Darwin himself, were content to rest with the demonstration of the physical and chemical continuity of species, or as Weismann called it, the continuity of the germ plasm. But there were others, among them Hering and Semon, professional biologists, and Butler, a literary amateur of philosophy and biology, who perceived that a psychic continuity of individuals and species was an essential postulate of evolution. To them must go the credit for the insight that evolution involved not only a continuity of substance but also of psychic organization and therefore of personality, between parent and offspring.

4. REMEMBRANCE OF THINGS PAST

Evolution is rooted in an inherited form of psychic functioning best described as unconscious memory, a peculiar and specific characteristic of living things, which is the fundamental matrix of the continuity of the germ plasm. A living being is not simply a complex machine of physics, a super-compound of chemistry, but an individuality, with not only a biology but a psychology, not only with a body but with a mind. And the relations of body and mind are such that they cannot be finally separated but only clearly conceived as a unity and an identity of body and mind always operating together.

No other conception of the nature of the living can include all that is known or inferred concerning the origin and development, growth and reproduction of individuals as well as species, the detailed facts of the whole evolutionary process. And just as metabolism, the construction and destruction of the physical basis of life out of the chemicals of foods, is the central fact of every living organism on its material side, so experience and memory, learning and remembering, the organization and integration of its psycho-activity, are essentials for its survival and progress. Memory and metabolism move hand in hand. Protoplasm and psychation are indissolubly associated in all the reactions and interactions of the living, including the hereditary continuities of the primordial germ plasm out of which they developed.

Of all the curious observations that biology has gathered in support of the concept of the origin of species by evolution, none is more fascinating than the various phases traversed by the embryos of different creatures. All multicellular animals go through metamorphoses, from a single round-shaped egg to the curiously designed, sculptured being characteristic of its family and species.

An embryologist, von Baer, accidentally discovered the great law of ancestral recapitulation, the repetition of ancestral forms in the embryonic development of individuals. Von Baer had forgotten to label some embryos of different animals that had been left preserved in alcohol. He found that he could not confidently place or classify these embryos or state their species from their appearance alone. It was necessary to know in what animal they had been produced to name them accurately. That is, in the early stages of development, the embryos of a man, a rabbit, a hen, a frog, and a fish look so much alike that it is possible to mistake one for the other. As von Baer himself wrote: "I am quite unable to say to what class they (the embryos kept in fixing solution) belong. They may be lizards or small birds or very young mammals, so complete is the similarity of formation—of all the animals."

Not only is there this striking resemblance between the first formations of the eggs of all vertebrate species. There is also a most curious similarity of the embryos of the later species to those preceding them, as the formation of their different organs progresses. Before coming to look like the typical creature of its own species, each embryo resembles the species that is now regarded as its true ancestor.

Thus the first stage of the embryos of a man, an ape, a cow, a hen or a lizard present formations in the neck regions which remind one

of the gill slits of a fish, and are consequently known as the gill clefts. They have no function at all in these embryos, although there is a series of arteries running down between the clefts, precisely as in the fish, where the blood takes up oxygen out of the water bathing the slits. In all of these vertebrates these structures are simply evidence that they are all descended from a fish ancestor, that is to say that they once were fish. The whole arrangement of cleft arches and their accompanying blood vessels and nerves are afterwards absorbed to give way to other tissues and organs normally placed in the neck and jaw regions. Similarly at this stage, the heart does not consist wholly or partly of a right and left chamber, but is a single tube of pumping apparatus, just as in the fish. All the vertebrates that live on the land, humans and birds, cattle and reptiles, pass through fish-like stages before they go on to their own proper shapings.

Not only do these passing gill clefts exist in the human and sub-human embryo. A snake grows for a time two pairs of legs utterly useless to it and whales sprout a set of teeth, later replaced by the true whalebone. A horse before birth has all five toes and only in the last months before parturition develops the one-toed condition. Organs and formations are reconstructed which are obviously reminiscences, foreshortened and abbreviated repetitions that are flesh and blood memories, veritable reincarnations of previous states of existence. The chrysalis of the butterfly, the larva of the bee or ant, the tadpole of the frog, all are stories of recapitulation, recollections of what were once final stages of development.

Another striking manifestation of this remembrance of things past is seen in the way the eyes of the flatfish, flounder, sole and plaice appear one on each side of the head as in other fish during their larval stage when they are newly hatched out of the egg. After a few weeks one eye migrates to the opposite side until it is set parallel with the other on the side that assumes the place of the back of the fish. The underside then gradually acquires a pale white color similar to that of the undersides of other fish. Thus a remembrance of the preceding form appears before the final form is attained.

Many other examples exist of this most mysterious tendency of living embryos to partake of the qualities of their evolutionary forebears, before they come into their own style of life. There is nothing comparable in the inorganic world or in the inorganic laboratory. It is as if the animal had to go through what it had done before in order to go on to whatever came thereafter. It has to put on the apparel and manner of its ancestor in a kind of mum-show, a pantomime of

its past, before it can realize itself in the present, and differentiate still further into the future. Even the origin of all sexually reproduced beings from a single cell, the fertilized egg, is a reminiscence of the time when all the living consisted of single cells, some of which finally coalesced or divided to make the simplest of the many celled animals.

Now what is the meaning of this utterly unexpected and awe-inspiring remembering behavior of the cells of the embryo of every species? Why does the adult-shaped animal have to stage these performances of what was once normal and important for it hundreds of millions of years ago? Why is this tale of certain of the ancestral characteristics of the species regularly, though quickly, repeated, like a child slurring the verses of a poem? We are wonderfully and fearfully made indeed, for we must be what our ancestors were, before we can be ourselves. Not indeed in every detail but enough to indicate the genealogical transition from ancestral simplicity and intermediate complexity to the most recent maturity in an unbroken series.

There must be an explanation for these divagations into the ancient paths and traditional patterns. And it would seem that it is a remembrance of things past. No matter what the physical concomitants and chemical mechanisms of its working may turn out to be, it can be fully and finally understood only in terms of the continuity of the psychic organization of the living organisms as it is handed on from one generation to the next, from one species to the next.

If the embryo contributed to the making of itself not only the chemical substances and reactions and metabolisms of its germ plasm, but also a memory of its previous states of existence and its modes of behavior in those existences a new light would penetrate the mystery of these recapitulations. For there are certain kinds of memory—unconscious memories—that work in just that imperfectly reminiscent fashion. In reciting a poem that has been long ago memorized, stanza after stanza is repeated in the order of its learning. But if a sentence or a phrase has been forgotten, it may be recaptured by returning to the preceding stanza and repeating it. One association of memories, that is, leads to another, is in fact necessary in order to reawaken the other. An organism begins with its earliest memories of itself—its most unconscious memories—goes on by links of association to what it was next, hurries through its earlier recollections, misquotes a little like a child rushing through the first parts of a recitation learned by rote, and continues with further memories until it arrives

at the frontier of the present—the completed phases of its individual evolution.

There is thus a routine of reproductive memory behind all embryonic development. All unconscious memory acts just like that, and the order of precedence must be preserved for it to run smoothly. Because the embryo is a concentrated essence of memories as well as substances, it reviews the stages of what it has once been and repeats what it has once performed before it attains its final form. So it goes through a fish stage because it dimly recalls once having been a fish—and it must recall that part of the story to proceed to the next. Thus it can be understood why a fertilized human egg, before it can become a mature human being, must rush through a sort of résumé of all it once was in the history of life.

5. MATTER, METABOLISM AND MEMORY

Matter, metabolism and memory! There are the trinity, three in one and one in three that make and evolve the living thing. Only that triune characterization contains a complete description of the activities and properties of protoplasm. Matter metabolizing continuously, changing chemically—protoplasm—is matter that is alive only when it is remembering, exhibiting some signs of a history and a past which it brings to bear upon the organization of the present and the problems of the future. And metabolism and memory are so co-ordinate that they can never be separated. Metabolism has its cycle in its two phases, of anabolism: construction, and catabolism: destruction, of the living matter. Memory, too has its cycle of anabolism and catabolism, of construction and destruction, of assimilation: remembering, and dissimulation: forgetting. The metabolism of living matter and the memory of living matter are the two inseparable sides—representatives of the body and mind—of the underlying entity whose continuity makes that single huge protoplasmic personality that could be called the life personality.

For that is what metabolizes and remembers continuously—in an uninterrupted stream—the totality of the living protoplasm, unique and identical throughout the living world, no matter what be its local differentiations and temporal variations. Metabolism and memory combined are our names for the driving forces behind its activities. Physical and chemical factors are naturally involved. But it is only when they are accompanied by the psychic life of each organism, with its sense of self-identity, which gives direction and integration to its life, and through it to all of life, that their metabolism attains

the quality of permanence that extends from embryo to adult, and back again to embryo, in a continuous series.

The individual sense of personal identity in human beings is dependent upon the existence of a concentrated collection of memories that are held together by the metabolism of the brain. Behind the veil of skin and muscle, eyes and nerves and the hooked networks of the gray cortex, there is concealed a self, a private secret self, which knows itself. That secret self is a product of brain memory and without memory it is nothing. It could never be, and it could never endure as the personality it is. Memory provides the soil and regulates the growth of every living organism which is also a personality in its own right. Ideas and images are rooted in it, and every fresh perception, thought and movement fuses with its background.

Memory unites countless incidents of every existence into a whole. The body would disintegrate into the dust of its constituent atoms if they were not constantly rebound and re-consolidated by the reactions of metabolism. Consciousness, the consciousness of self as a whole, identifiable and surviving in time and space, similarly could not continue to exist without the constantly integrative, acquisitive and assimilative powers of memory. For it would be split into as many fragments as the seconds it experiences. Memory in short is the architect of the mind, as metabolism is of the body.

Yet memory and consciousness are by no means identical. Consciousness is primarily an awareness, whether of a perception, or of a feeling, or of a desire or of a recollection. But memory continues without it. It possesses its own psychic autonomy as a nonconscious psycho-activity, an unconscious psychation. Memory may be only potential consciousness and can function without being sensed as the immediate state of awareness in the personality, which we are accustomed to call consciousness. Memory can be unconscious.

Unconscious memory is latent in the gray matter of the brain as may be inferred from disturbances of it that occur following wounds and lesions of the head. It functions for the recall of its constituents according to the laws of association. I was conscious of this yesterday, self-consciously, went to sleep, or became absorbed in some other activity, forgot it, or dismissed it from consciousness and now am again conscious of this or that, or again learning this or that, remembering that I experienced or accomplished the same the day before. What has happened to my memory, where has it been meanwhile? Something has been registered, assimilated and preserved in the brain

substance. And when the spark of association is applied, it flashes from its unconscious condition into the conscious.

One principle stands out: Whenever there is evidence of the presence of unconscious memory, we may be sure that there is psychic life. Also that where there is memory, there has once been consciousness, conscious psychic activity which has, as it were, deposited the memory. Upon unconscious memory must be placed the burden of carrying the psychic past and of maintaining the sense of psychic persistence which is at the core of the feeling of the identity of the self from one moment to the next, and from one day to the next, from one year to the next, and from one generation to the next.

6. UNCONSCIOUS MEMORY BEHIND ANCESTRAL PERSONALITY

These continuities of substance, metabolism and memory, as the constants among the variables of evolution, enable us to understand better the strange reproductive mimicries of embryonic and larval recapitulation. For there are certain most interesting and important consequences of the relation of unconscious memory to the concept of personal identity, that have a special significance for the unity and continuity of the life-personality. The fundamental responsibility of unconscious memory both for the maintenance of personal identity and species persistence reveals a new picture of the place of the individual in the evolutionary scheme. It provides indeed a genuine illumination of the contributions of the psycho-activity and psycho-reality of each organism to all of the adventures of form and function that have found expression as life.

In the face of this contribution of every individuality to the totality of life by means of its memories, the individual consciousness as a wholly isolated figure in the universe assumes a changed aspect. The average human being thinks of himself as a sharply defined and bounded person, with a bodily beginning and ending, dating from birth to death, as every tombstone epitaph records. He regards himself as an ambulatory but concrete entity, severed from the remainder of humanity and the cosmos. Nearly everyone assumes that there is nothing easier than to bound the not-I and the I. We all carry within our memories an image of ourselves, the image of the ego, a mental picture or photograph by means of which we identify ourselves. And we carry similar photographs by which to identify others, portraits that have come to be known by certain psychologists as the *persona*. We know, though, that the photographs are only static representations of realities that are continually changing. The psychic photograph

is useful as a point of reference, as a convenient mode of behavior. The names and the images remain from infancy to old age with all their transmutations of face, figure and faculties, even though we know that with the passage of time we have not remained the same, as a strict interpretation of the words—personal identity—implies.

A man may lose his conscious memories because of a shock or a blow and still preserve his personal identity. In the familiar phenomenon of amnesia, the individual no longer remembers himself—he can no longer recall his memories or his past history or his past self. He cannot remember his name, his place of residence, his relatives and associates or the nature of his occupation. Sometimes he even forgets his position in time and space, he becomes completely disorientated. Yet these memories may be restored by another shock or a fever, or the mere lapse of time. His personal identity is returned to his consciousness—he may again become conscious of his past, the totality of his psychic history which has not been lost to him, but has remained latent and buried in the depths of his unconscious memories. Sometimes he may be assisted in this restoration by hypnosis, or it may occur spontaneously. As much as twenty years may pass before the return of the original personality.

The sense of personal continuing sameness, the feeling of an integrated continuous self, existing and identifiable now, in the past or in the future, or in any two consecutive moments, is dependent upon the preservation of unconscious memories in the brain. The persistence of unconscious memory maintains this sense of personal identity. The brain, or its protoplasmic equivalents in any living organism, functioning as the carrier, comes consequently to occupy a new place in the history of life. For it serves as the medium by which unconscious memories are preserved, transmitted and continued from one generation to the next.

With the annihilation of the brain or body in death, the physical and chemical personality, as far as we can follow it, registers its finale, comes to a full stop. And with every moment of time while it is alive, it is modified and changed from moment to moment, from year to year. Yet it remains the same personality, the same body, the same brain from beginning to end. We say that a man of three score and ten, whose birthday is being celebrated, is the same person as the newborn baby who was once given his name. Every year of his life his birth is celebrated as that of the same person. Yet the two may be as completely dissimilar in appearance and behavior as any other two individuals compared at random. A continuity of

something, of memory we say, between the unnamed Disraeli who was an embryo in his mother's womb, tied to her by the umbilical cord, and the Disraeli who bought the Suez Canal, makes it necessary and legitimate for us to regard them as one and the same person or personality. An underlying psychic identity is maintained from birth to death, dependent upon the dynamic foundations of whatever is preserved as memory. Logically we must grant that there is an undeniable continuity of unconscious memory, a form of unconscious psycho-activity, in all the preceding states of the personality, as well as those consequent to any given time in its development.

The persistence of unconscious memory is likewise our only clue to the recurrence of the same personality—the self-identification of the personality—in the awakening from sleep.—What, then, determines the recovery of the sense of one's own self, one's own personality, as the unique background of past personal history upon which the present conjunction with it takes place? The awakening sleeper gropes about for links to an understanding of the newly presented stimuli of the room, the light of the sun or the sounds of the outside world. That selfsame individual returns and no other.

Diurnal reincarnation of personality returns the self that has been asleep to him or her who went to bed, rather than one of the hundred or thousand or many more of other possible personalities with whom there has been some traffic or identification the day before. A restoration of the personality to consciousness in the reawakening from sleep is achieved because of a continuance of the real unconscious self in the unbroken chain of its essential memories. That is why we take it for granted that the man of today is one with the newborn babe from whom he has derived, just as the natal infant is one with the single cell out of which it has grown.

Unconscious memory, then, is that which holds together, that agglutinates and organizes into a patterned self-sustaining system the fragments of personal experience and imagination. It is that which constitutes the cement of the diurnal and recurrent assimilations and transformations of the psychic personality. Personality and unconscious memory seems to run parallel in a co-ordinated fashion in space and time. Where unconscious memory begins, there personality begins; where it ends, there personality writes its period.

But who can say where the unconscious psycho-activity—the unconscious memory—begins or ends? In the fertilized egg? But if there is reason to believe that this egg is already impregnated with inherited memories as well as with inherited substances when it commences

the curious review of its states of existence in the past—as from fish to man—it is necessary to admit that its personality also extends beyond that particular point of protoplasm in time and space. It follows, indeed, that it extends back to its progenitors as distinctly and definitely as does that of the sleeper who awakens alert and utterly alive, to begin a new day's life, with the tired and dull individual who went to sleep the night before.

That germinating egg is itself derived from two individualities, for it consists of the fused concentrates of the personalities of its respective parents, known as spermatozoon and ovum. The reproductive particles, the representatives of the personalities from which they are derived, manufacture themselves into replicas of their originals, much as the cut fragments of an earthworm construct themselves into a likeness of their source. The pieces and that from which they have originated must be considered to be one and the same organism. If unconscious memory is continuously and connectedly at work in them, it must be concluded that one and the same persistent personality has been operating in parent and offspring.

The apparently isolated and self-contained individualities, from whom these reproductive elements came, also were really self-regulating and self-maintaining elongations and fragmentations of a single larger individuality, which indeed includes within itself all of them. It is the larger personality which includes all parents and all offspring, all families and all their relatives, all varieties and all species. An analysis of the facts of embryonic development, evolutionary sequences and unconscious memories shows how they are all linked by the grand law of the relation of all individual lives to the one life, the life which is one continuous personality—the life-personality.

Parent and child then are simply particles of that one greater personality and a family and its congeners belong to that one personality. Indeed all species of all the living constitute that one single comprehensive personality. There can be no escape from that conclusion, since the protoplasmic reincarnation of the generations and their variations logically requires an uninterrupted remembering psychic identity and a continuity of its evolutionary organization to explain the facts of embryology. The strange reproductions of cells, tissues and organs by which the fertilized ovum organizes itself into the representative of its genus and species imply a reincarnation and reproduction of unconscious memories and experiences. In turn they represent the residues of once conscious efforts and purposes, which

must be ascribed to the psycho-activity of a unitary being embracing them all.

7. CONSCIOUS TO UNCONSCIOUS MEMORY

When does conscious memory become unconscious? It is an established principle of the psychology of habit that memory becomes unconscious when the concentrated effect of conscious effort is no longer needed in a situation. When the intense activity of awareness is no longer necessary or desirable for the problem at hand, consciousness, in the sense of attention, fades out. The learning of any particular skill, such as skating or bicycle riding or piano playing, for example, may be attended by the most acute consciousness of the difficulties involved before the goal of smooth performance is attained. Then the skill functions unconsciously, that is with no attention paid to its various steps or parts. Observe the beginner with a violin. An enormous amount of consciousness is required as each note is guided from the eyes to the fingers. But once learned, after long and arduous practice, the violinist's performance becomes unconscious. The playing of the professional virtuoso is an amazing miracle of unconscious perfection. Each note received by the eyes is transmitted to the fingers with the speed of thought. Because of the introduction of a minimum of consciousness, there is no waste of energy.

By repeating the performance of any habit a certain number of times, and with greater and greater ease and skill each time, the amount of consciousness necessary has been reduced to a minimum by what may be called the law of economy of habit-consciousness. It is indeed unconscious according to any reasonable criterion of the presence of consciousness that may be applied. Unconscious memory, therefore, releases energy. That is, the more unconscious memory one develops, the more energy one has for performance. Consciousness directs activity only as long as conscious interest—that is conscious attention and purpose—is necessary to bind together the elements of what has to be learned. Once consciousness has done this work, it is eliminated. When a habit or a skill or an idea has become well assimilated or organized into the personality of the individual, consciousness in that sense vanishes from the total pattern of the performance. In fact its reappearance may become an interference with the smooth practically perfect rendition of what has been learned.

Only that is really known which is unconsciously known. The participation of consciousness in any act of a living organism is the signal of ignorance, or a partial or incomplete knowledge, of difficulty,

novelty, lack of experience, innocence of understanding, doubt or choice. But whenever there is ease, efficiency, grace, a certain quality of mastery or routine in performance, it may be assumed that there was once an intense consciousness of effort with increasing dominance of the material or situation, until the unconscious stage of knowing the how or why or what of it has been attained.

Now is it possible that there are apparently unlearned acts and unstudied behaviors of the newborn babe that may be put down to the functioning of unconscious memories? And if there are, would it not have to be admitted that they have been transmitted from their parents who in turn received them from their parents in an unbroken chain? Hence is there not functioning of the same underlying personality, possessed of these unconscious memories, in both parents and offspring? Those acts have been performed and those techniques have been followed over and over again by countless generations.

The making of the heart and the circulation of the blood, the manufacture of the lungs and the technology of respiration, the construction of the limbs and the creation of the organs of special sense, do they not belong to the same order of unconscious performance, dependent upon a similar kind of unconscious memory? If they do, it must follow that there was a time when their making was attended by the same kind of striving, pressing, mastering consciousness and of conscious effort. There must have been the same feelings of need and dissatisfaction, of failure and success, in repeated trial and error, that are well known to have attended our own first attempts at walking or talking or writing or reading or any of the elemental habits we take for granted as learned in our daily lives.

Now, it is also a pertinent fact that we are most unconscious of, and have the least power of returning to consciousness and conscious control of, these very acts of circulation of the blood and digestion of food, the making of our skin, flesh and bones. These are indeed our oldest habits, those which were learned and evolved back in the most ancient millennia of the history of life. We have more consciousness of and more control over such acts as breathing and the swallowing of food, habits which we developed immediately after birth, and talking, walking and so on which are the most recent of our acquired skills and therefore most liable to error and disturbance. The older a habit, the less readily can it be returned to consciousness or changed by it. Only when there is trouble or disease, lack of ease, in their performance does consciousness return to them. The oldest acts of consciousness, now so unconscious as to be inaccessible to the ordinary

mind, such as the working of the stomach or the heart, may be restored to consciousness by the effects of illness, or interference with their normal course such as certain Yoga methods produce.

An ancestral life-personality, a personality that goes back an indefinite number of generations, indeed to the beginning of life itself, must have been at work behind those inventions, discoveries and techniques, and habits that we call our organs and their functions. This ancestral consciousness connects the conscious learning of a human being, as it is finally mastered and deposited in its unconscious memory, and the behavior of every embryo and fetus in the womb, traversing the ways of life of its ancestral species. That is the only satisfactory and rational explanation of the mysteries of recapitulation in the reproduction of species which will include the facts and mechanisms of unconscious memory. That conception enables us to understand the remarkable spectacle of the individual manufacturing himself out of a single egg and reciting in rapid succession the totality of the evolution of his ancestors, presenting an outline or foreshortened view of that which he once was in the long line of his previous existences.

8. PSYCHO-ACTIVITY UNDERLYING EVOLUTIONARY CREATION

A multitude of phenomena displayed in embryonic development reminds one irresistibly of the violinist or pianist who plays so well, because his once consciously imperfect knowledge has become arranged in a pattern of final unconscious completeness. The parts of such a dynamic pattern cannot be willfully disarranged. If called upon to traverse certain successive passages from a composition, the pianist will have to start from the phrase which leads into them, and indeed he may have to begin from the very first parts themselves.

In the execution of musical compositions, wholly comparable to the serial unfolding of organic constructions in embryonic development, there operates a law of succession of associations in which one member of the series suggests that following and only that one. In accordance with the laws of unconscious memory, what happens in the embryo indicates that the germ plasm operates along the lines of the continuity of its psychic associations. It suggests centers of remembrance called into activity by what has been associated in the past, one after the other, in an uninterrupted and specific fashion.

Now this conception of the action of unconscious memory does not necessarily oppose or contradict any correlated scientific explanation, presented in terms of physical and chemical causes and effects.

But no matter what the mechanics of what happens when unconscious memory functions, either in the individual or in the species, *the phonographic record and the music it generates can never be said to be the same entities.*

The physiology of memory can be worked out and doubtless will be worked out in the researches of biological laboratories. Such researches will be the source of most interesting and important discoveries and ideas. Yet, although they must necessarily involve experiments to analyze and explain the physical and chemical concomitants of memory, conscious or unconscious, which accompany the creative psychic events of embryonic recapitulation, that analytic reduction to the physicochemical details will not abolish the facts as they can be interpreted in terms of driving purpose and accomplished satisfaction, produced by a psycho-activity.

In some fashion all sound theories of habit and memory, conscious and unconscious, have to turn around hypotheses of physiological traces in the brain, in the nervous system, in every form of protoplasm, the residues of the material accomplishments of the perceptions and actions of living creatures. The properties of such physical and chemical traces of experience and learning correlate and integrate with the psychic events in which they are involved. The accuracy of reproduction in personal memory and in racial memory must depend on the degree to which these effects of consciousness have been organized into persisting patterns, appearing successively like the parts of a symphony.

In the recapitulation of species from egg to completed individual, there is thus reproduced a melody of designs, a succession of motifs, which, because of their fluency and harmony, simulate absolute automatism in their repetitions of ancient orchestrations. It is for the physicist and the chemist, the biologist and the geneticist to pick out the separate notes and their underlying alluvial notations in the protoplasms. And there can be no question that they will in time produce a mathematical statement of the physicochemical mechanisms included in all these varieties of memory. But the most perfect analysis of these events will never exorcize the presence and functioning of a higher and different order of energy in living organisms which is the activity that may be called for short: psychation. That activity, psycho-activity, is as specific to the manifestations of life, as the phenomena of radiation are characteristic of heat, light and electricity. This psycho-activity is as much entitled to scientific recognition as a specific activity in life and the universe as is radio-activity. It cannot

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be overlooked or neglected because it cannot be bottled, powdered or weighed upon the pans of a chemical scale.

9. EMERGENCE OF THE LIFE PERSONALITY

Because there is no spontaneous generation or creation of species, because all living matter comes from that which has been before, no personality of any human being or animal can be limited or defined in time and space except relatively. As a matter of fact, every human personality represents an alternation of phases between the minute being which is the egg and the full-grown individual evolved out of it. Among certain animals, such alternation is obvious. There is such an alternation of generations between the frog which lays an egg, which becomes a tadpole, which becomes a frog, three generations in the same individual. The moth makes itself into an egg, which makes itself into a caterpillar, which makes itself into a chrysalis, which makes itself into a moth, a series in which there are four generations of the same individual, counting the phases of individuality from one egg to the next succeeding. There is the medusa which manufactures a larva which turns itself into a polyp which changes into a strobila, which is transformed again into a medusa, in which five such different phases are traversed.

Each of these phases is a separate and distinct individual. In all these phases the matter that supplied the special pattern and characteristics of the individual has undergone many mutations and much has been discarded. They are connected only by a continuity of patterns of matter, metabolism and memory. Yet no one can speak logically of these different phases of the same being as separate organisms or personalities, for they obviously belong to the history of a single entity.

Therefore, the different individualities one sees as one looks about the organic world constitute separate and distinct personalities only in a manner of speaking. Strictly they cannot be described as such, and indeed are so described only as a matter of convenience, with a certain confusion of meaning. Actually and accurately there is only one personality alive among the living, a single dynamic life-personality, flowing as one continuous lifestream with countless contributing rivulets. Or, from another viewpoint, this super-personality of life grows like an enlarging tree, out of which filaments and branches emerge as individuals with a certain temporary definition. Individuals are simply visibly defined patterns, self-organized and regulated, but essentially organic variations of the same underlying superindividual. Logically and biologically we are all the lesser subordinate subdivisions

of a single, inclusive, continuing, immortal personality: the personality of life, or the life-personality.

Before the advent of microscopes and microscopic techniques, it was possible to fancy that the individual was a unit of his species and it was customary to think so of his body. It was natural enough to assume it as self-evident that every individual organism was a unique entity, a homogeneous personality. But the microscope revealed only a few centuries ago that we are not the simple integers we thought ourselves to be, but are compounded of the true units of life, the cells of protoplasm. These units, bricks or blocks of pulsating life stuff constitute countless communities within ourselves, interconnected by filamentary bridges of their protoplasmic substance.

The cells are self-contained and self-determined living personalities. Tissues and organs are mosaics of cells. Cells are born and they die, and many of them are freely moving, within the circulating fluids and upon the surfaces of our bodies. They have a characteristic life cycle of their own. There are billions and billions of red cells and white cells and wandering cells in the blood and tissues which live only for a month or so. The cells of the skin and the internal organs are a vast procession of individualities which function for a time as part of their greater inclusive body, to pass on and be replaced by others like themselves, carrying on their activities for their brief period of life. Each one breathes, eats, excretes, suffers, tires, and sleeps and then degenerates, disintegrates and dies.

To quite an extent all these cells are independent of one another, though all in common are dependent upon the vast super-creature containing them which supplies them with oxygen and nutriment and reason for existence. Apparently without any consciousness of whom, and for what end, they live out their lives. They all contribute parts to the human personality they are serving.

Among them are the reproductive cells, the spermatozoa and the ova. Next to them in the scale of independence function the white cells of the blood. These minuscules of beings traveling about, up and down the blood stream and through the tissues, must possess some elementary form of consciousness and feeling. Anyone who watches their approach and tactics regarding an object to be overcome or an obstacle to be removed, cannot but be impressed with the presence and action of some sort of intelligence, a form of psycho-activity, however lowly and limited it may be. In their adjustments to the problems of their lives they exhibit an interest in self-preservation and a

purposiveness in fulfilling their functions against all odds. And that they can learn and remember, in an exceedingly limited way, has also been proved.

Every one of these cells must function with a certain amount of psycho-activity. There can be no reason for assuming that suddenly, by some act of parthenogenesis or transfiguration, psychic life appeared in the more massive of the living. On the contrary, all the evidence points to a gradual evolution and step-by-step refinement of the psychic faculties and functionings in protoplasm. It may be stated as a general law that wherever there is protoplasm, there is psychation. All three concomitants of individuality: matter, metabolism and memory, are found in every one of these invisible microscopic creatures.

There can be no question that these most fundamental elementary units of life compound together into a single unified integrated being, which comprises them all: the human body-mind, the human personality. Yet there is no reason for suspecting that they have the slightest inkling of their relation to it or of their functioning within its boundaries. If a white cell, discharging its duties as a policeman against microbes, a red cell transporting its quota of oxygen, a wandering tissue cell removing some debris of metabolism, are the constituents and servants, in their time and day, of a more inclusive organism, may we not conclude that human beings themselves join together to create a personality and consciousness of a correspondingly higher scale and magnitude, the personality and consciousness of the human species? And all species and all genera, all the interrelated groups of the animal and vegetable kingdoms, pyramid in life and the personality of life. All living bodies and personalities compound into one vast organism of protoplasmic psychation. And this superorganism configured out of cells and bodies much as the soldiers and divisions of an army unite into a superorganization, with its directing marshal, possesses a continuous past and a continuous future.

Against that parallelism might be urged the objection that whilst we humans are self-equilibrating and self-sustaining in our environment, the cells are dependent upon us for their living, and are, therefore, not to be regarded as independent personalities. That objection is not valid because cells, white cells or epithelial cells or connective tissue cells, may be deported from their native habitat in the blood or in the body organs, and kept alive, in test tubes suitably supplied and refreshed with a nutritive medium, indefinitely. In fact, so indefinitely that the experiment has been said to prove their immortality. Thus the

cells of a chicken heart have been kept alive for twenty-five years. The heart kept functioning, beating with its regular rhythm in the solution in which it was suspended. Such a mass of tissue, like every single cell in it, has a degree of psycho-activity which integrates it and maintains its unity.

We human beings are just as dependent upon the conditions of our environment, of our earth atmosphere of oxygen and nitrogen and upon the foods elaborated by plants as are the white cells upon their particular medium, the blood. The individuals of the vegetable kingdom are not able to move themselves to obtain food and shelter. They are shackled to the ground in which they are rooted. But otherwise they behave as independent beings, going about their business of living and growing and reproducing, without let or hindrance. Human beings and animals are just as much confined and bound by their atmosphere and environment as their component cells are by their atmosphere and environment.

10. BLOOD CONTINUITY ACCOMPANYING PSYCHIC CONTINUITY

Among all cells there is a constant intermingling of substances and an incessant interweaving of metabolisms. One influences its neighbor, whole populations interact and interflow and the nervous system and the blood circulation contrive an essential unity out of them. There is a quite similar ebb and flow, intermixture and diffusion of human substance and capacity throughout the generations.

A man's parents are two, his grandparents four, his great-grandparents eight, his great, great-grandparents are sixteen. Five generations back there were thirty-two ancestors. Counting only ten generations back, there have been almost 1500 strains who have contributed their protoplasm to a particular individual. In twenty generations, a period of about 500 years there were 1,442,176. For thirty generations, or about seven hundred and fifty years ago the exact number is 1,956,282,976 or a little less than the whole total human population of the globe today. We are forced to conclude that something of every human being alive at that time has entered into the making of every one alive today. And the same holds for the future generations.

A thousand years from now, something of every reproducing human being of today will be a part and share in the constitution of every personality then alive. Generations thus fuse incessantly in one flux of life. The personality of this generation, the individual of today, is simply a condensation in the current of the living, to be redistilled

into a tremendously greater and ever swelling tide of life. The human race is in turn linked with all the rest of living creation as its own members are linked with one another.

If we, as individuals, are all constituent parts of that great synthesis of physical protoplasm, then it is so much more true that our thoughts and wills, emotions and decisions, memories and achievements are tributary to that greater inclusive psychic movement which is the life personality. He who thinks his secret thoughts and cherishes, perhaps, his hidden motives, as well as he who is mortified by isolation and disjointed from his kind, is but an interval in a larger duration of being, a pulsation of a more inclusive heartbeat. All so-called individualities are droplets out of an immense vat of memory into which every thought and every effort of all mankind as well as of all the animal and vegetable world funnels its fluid of experience.

Many and diverse are the images and analogies that might be employed to assist the understanding of this inclusion of the lesser segregated and sundered isolates of consciousness and protoplasm into the only ultimate unit of individuality: life! As the waves of the ocean, as the leaves of a tree, as the feathers of a bird's wing, the organisms of life combine as its cells into a continuous unity in multiplicity, and multiplicity in unity. All human individualities are miniatures of its personality, united as the one major assimilating entity and activity: life. All human beings, all living beings, are carriers and particles of that personality as our own billions of brain cells are vehicles of the incidents and transactions of our evolving consciousness. In time and space, the evidence is conclusive that there is only the totality of the one historic record of a single all-merging, all-including life personality.

And that life personality is greater and more inclusive than any of its members, not in size alone, nor in age alone. For when two cells or individuals come together, something is formed that is more than either or their sum. Cells conjoin in tissues which have properties that are not those cells, tissues associate to make organs which have functions above those of tissues. Individuals taken together as a species create a being with potentialities and achievements beyond that of any unit member. Species flow together into a creation with capacities beyond understanding of even the species mind. Cells and tissues and organs resolve into the harmony of a body-mind. Individuals and species and genera amplify into the blinding radiance of life itself as the single life personality, possessed of an unconceivably greater quality of knowledge, beauty and power, but limited and growing, too, at its own level.

3

THE BRAIN AS THE MEDIUM OF CONTINUITY

PSYCHO-ACTIVITY IS INTIMATELY AND INEXTRICABLY ASSOCIATED WITH matter. Wherever there is evidence of the organizing, remembering, anticipating and directing energy of psychation, there is also found matter. The material fabric is the grayish, translucent slimy restless substance named protoplasm. Protoplasm, the physical basis of the life personality, when chemically analyzed, yields many chemical elements, such as carbon and nitrogen, hydrogen and oxygen, sodium and calcium, phosphorus and sulphur, iron and iodine, and traces of other known elements. They make unique and indispensable contributions to the constitution and dynamics of living matter; in fact it has been demonstrated that psychic powers are dependent to some extent upon the amounts and reactions of these chemical elements and their compounds. On the other hand a certain subjection of living matter to its own psychation has also been proved. The creative powers of unconscious incubation and conscious effort cannot be denied in the history of life.

1. THE MATERIAL CONDITIONS OF PSYCHATION

No longer is the primacy of either mind or matter in protoplasm argued. There has gradually come a recognition of the artificiality of the language distinguishing them. The words body, mind, matter, psyche are merely verbal conveniences of discussion and classification of certain aspects of life. Their fundamental inseparability is now acknowledged in the concept of mind-matter or matter-mind. By their constant conjunction in thought and speech as a single reality, a number of pseudo-problems and unnecessary confusions are eliminated. Radio-activity, the sphere of influence of spreading fields of radiant energy, comes to dominate the more purely localized material or chemical reactions, and in turn comes to be dominated by the more potent ranges of psycho-activity. The pattern of polarity con-

stituted in such mind-matter by psychation and metabolism shift together in all living organisms from the lowest to the highest and most complex. As metabolism becomes more complicated from amoeba to man, the concomitant psychation also progressively evolves into an amazing complexity of consciousness, until in man it becomes an assimilative awareness which would ingest the whole universe. The human body itself becomes an object of its own consciousness. Nevertheless, when objectively observed it will have to be admitted that all psychations, whether unconscious or conscious, are thoroughly embedded and ineluctably saturated with the material contents and reactions of the living organism.

Evolution unfolds a gradually increasing complexity of materials and structures in the organic design of organisms. The lower and earlier forms in the historical scale originate the higher and later ones by mutations of chemical constitution and structural arrangement of the unit components of protoplasm. Chemically and physically the progress of life has consisted in this increased complexity of association of atoms and molecules. The genes and the chromosomes thus formed have acted as the material carriers in reproduction of the transmissible properties of the life forms which have been the outcome of these associations. The hierarchy of systems evolved by these transformations of life have been tested in various situations by the environment, familiarized as the conditions of natural selection. Concomitant and correlated changes of its psycho-activities and their material substratum have regulated the adventures of life in its ascent from the earth and its waters toward the heavens and stars.

2. LABORATORY CREATION OF LIFE

There has always been this conditioning of the possibilities of life by the range of variabilities of living matter. Now the nature of matter is still being subjected to inquiry by science. The question of its ultimate constitution has by no means been finally answered. The ninety-two chemical elements known have been found to consist of more elementary units, electrons and protons and positrons and neutrons. Energy has been analyzed into the units that are known as quanta, photons and so on. Others are still to be found and named. Doubtless all of them will be found to be constructed of some original unit of a universally distributed energy. For it has been shown that matter and energy are interchangeable. Energy can be considered matter unbound, freed from its bonds of organization. And matter

can be regarded as frozen energy, energy locked in embrace with its own affinities.

If matter is compounded of energies organically patterned, psycho-activity can be traced to its utmost depths, into the very interiors of its ultra-units. A psycho-activity is entrenched in the constitution of the most primeval essences of the universe. Cosmic psycho-activity may indeed be the universal energy out of which the elementary units of matter and energy are constructed.

Matter is old, so very old, that one says without visualizing what one means: many billions of light years. Our solar system, and out of it, the earth, was born some two billion years ago. After many preliminary gestations life emerged hundreds of millions of years ago as a weakly organized, tentatively stirring system of chemical chains and figures that curved and coiled around themselves as ring designs of different atoms until at last that highly complicated organization, an organism in itself, a complete cell of protoplasm, appeared and made itself into a completely self-reproducing unit.

It is the distinctive property of life that it possesses the power to maintain its own essential pattern and identity even though constantly changing within itself and in spite of the constantly changing conditions outside itself. That is what uniquely differentiates the nonliving machine from the living physicochemical system. The spectacle of life has been historically correlated with its earliest predecessors in the elements, the atoms and molecules of the earth. The whole spectrum of transition from inorganic molecules to the transiently organic and then completely alive protoplasm can be roughly mapped. Large, exceedingly complicated molecules of proteins originated in a certain capacity for attraction, combination and configuration of hydrogen, nitrogen and carbon. The colloids they formed became the smallest viruses. The largest viruses combined to form the smallest bacteria. In turn these gave rise to the protozoa and the serial story of ameba to mammal to man.

The original mystery of life is still unsolved in the laboratory, but several viruses have been crystallized as huge proteins. In their crystalline form they are not alive—they do not metabolize or reproduce themselves. But when they go into solution and come into contact with living matter, or extracts thereof, they begin to live and reproduce. The genes, the elemental particles of heredity, the bearers of the constitutional characters of species have about the same dimensions as viruses. Viruses and bacteriophages and genes would seem to be the same primeval order of living matter. Cells may well be colonies of

genes that once were single viruses and bacteriophages. At any rate we appear to be approaching the realization of the dream of that great genius of biology, Jacques Loeb, which he declared was the ideal of experimental biology—the creation of living matter. It is extremely doubtful, however, whether that objective will ever be attained. For life seems to have originated only once; all living forms have derived from that primal ancestral event. As soon as conditions on the crust of the earth made it possible for life to appear in its waters, protoplasm emerged. But why has it not appeared and reappeared if it was only a matter of carbon and nitrogen chains and rings becoming characteristically associated?

There is no evidence of spontaneous generation of the most primitive protoplasm either in the muddy waters of the sea or in the swamps of the earth. If there were such spontaneous generation, its products, some say, would be immediately consumed by the ravenous older protoplasms around them, and so could never survive. It has, however, been most firmly established by laboratory experiments, under the strictest conditions, that life can now come only from life. All attempts to create life out of the lifeless without the intermediation of already living matter have failed as was proven in Pasteur's classic demonstration and before him by Spallanzani and Schwann and Helmholtz and others. It is possible that protoplasm was created through the action of light and electrical storms upon organic substances in solution. But in no laboratory has such production been imitated. No organic fluid which has been boiled and kept uncontaminated by invisible carriers of life has ever generated it, even though all the chemical elements and physical conditions theoretically necessary were there.

3. THE CENTRALIZATION OF CONSCIOUSNESS

For life possesses not only form and function, substance and motion, but also direction. That direction is fundamentally psychic in nature, as it determines the evolutionary emergence and trend of variations along lines of persistently striven for tendencies. There are numerous examples of mutations in species occurring independently of environmental conditions, in accordance with the principles of orthogenesis. These do not seem to arise by chance but originate and push their movement along definite directions. They are gradually amplified and finally fully expressed over a long series of generations, always in the same direction, sometimes despite the opposition of very great changes in milieu and habitat. Behind such persistence must be a continuity

of objective and memory. The maintenance of direction in organisms is fostered by the creative activities of unconscious psychation. Viruses and bacteriophages, genes and chromosomes thus combine and vary to form later life developments in a steady drive toward the production of more and more complex and more and more stable systems of living. Only by a hiatus in our vision are we prevented from actually seeing the invisible chains of connection which link the simplest with the most diverse and complicated manifestations of life as a forward march.

The course of these evolutionary movements is by no means a straight line. It is often circuitous or zigzag, ending in many blind alleys. But the general drift becomes more and more apparent under scrutiny: *it is an intensification and emancipation of consciousness through a simplification and stabilization of the material conditions of its being.*

At the rim of contact of an ameba or paramecium with its environment, there occur movements of adaptive reaction which can be regarded as evidence of the simplest psycho-activity. At first, consciousness, at its lowest, dimmest level, seems spread out at the surface of the protoplasm, like electricity condensed on a particle of matter. Then consciousness gradually becomes diffused and then concentrated throughout the evolving substance of life. Psycho-activity may be recognized by its effects, like any other activity such as heat, light, electricity. There is a certain sensitivity, an irritability to the effects of any one of these other energies. There follow reactions of awareness, visible as characteristic adaptations, observable even in those relatively lowest organizations of life whose behavior can be watched only under the microscope.

Three qualities of psychation: sensitivity, awareness and memory are the primary elements of consciousness. It is difficult to imagine the quality of consciousness pervading the elementary sensitivity of the protozoa. The quality might be likened to that kind of awareness present in one just emerging from an anesthetic, or the dream consciousness of one just about to awake. It must lack the vividness of the sensations of the higher animals because no specific sense organs are available to concentrate and hold the specific energies involved. It is perhaps more like that of the flashes of subconscious psychation which a fetus experiences as it moves about or reacts to stimulation. At any rate, the psycho-activity of these lowest creatures is something that does not burn steadily but flickers. It is not a stream of conscious-

ness, but rather a series of staccato echoes that reverberate and pass like the incidents that provoke it.

No sort of continuous consciousness could be evolved and maintained until there had developed within the creature some area as a center of a continuous and co-ordinated memory in which patterns of organization could be constructed out of the deposited residues of experience. Life had so to organize itself as to preserve and protect its consciousness from the vicissitudes of its metabolism. As soon as there appear the quiverings and contractions of specialized contractile or muscular tissue, nerve tissue follows. Consciousness then becomes shifted to the interior from the surface of the organism. As a result, excitation at the surface is transmitted to a central area established not only to react to the present; but to make for its persistence an area for comparison with the results of past awareness and past experience. In consequence there results a prolongation of consciousness and a linkage of its moments into a single stream interrupted only by sleep. And even then unconscious psychation continues and expresses itself in dreams.

For that kind of enduring consciousness, in which the present experience of the individual is fused with that of his own past, a chemically and physically stable interval area within the protoplasm is prerequisite. No persistence of memory is conceivable without it. Amid the constant permutations of the chemical substances that compose living matter, no efficient orientation toward the environment is possible until there is established a permanent locus for the individuals' psycho-activity. Such an organization makes possible, within its limitations, the recording of past experiences and the recognition of similarity to the present. Even unconscious psychation in an organism is only potential until such a relatively stable area of organization has been achieved within the protoplasm.

The nervous system, therefore, is laid down in the matrix of the living stuff as its means of registering and transmitting and co-ordinating those excitations within and without itself which are of significance for its survival, reproduction and progress. At nodal points of the transmission lines—stations of record—the nerve cell ganglia, are interposed to liberate energy for further transmission to the topmost dominant ganglia, the brain itself. Within that brain an evolution within evolution has elaborated the most complex system of substances and energies in the universe, working under the simplest conditions attainable for such complexity.

4. MATERIAL SUBSTRATES OF PSYCHO-ACTIVITY

The brain as a center of consciousness and psychation has a long history. It has many parts, areas that represent older and younger lines of development and co-ordination. In the long perspective of its evolution, the additions and revisions of its architecture can be viewed as all contributing toward an organ and organization set apart to provide an oasis for consciousness amidst the ceaseless flow, the fast and furious play of chemical metabolisms that surround it, in which it would be drowned if not for an organic bulwark against their tidal waves.

It is certain that most of the detectible matter in the cosmos is located in the blazing nebulae and suns where the molecules, atoms and subatomic particles are engaged in colossal whirl-swirls of gaseous movements and collisions. Nothing ever occupies a fixed position or constructs any permanent design. All that binds the molecules together by atoms are the terrific forces of intra-atomic cohesive energy.

Outside of suns, there is scattered matter through which radiation simply evaporates and disappears into space, neither possessed of any fixed design or stability of form. When certain crystalline solids do attain fixity of shape, these are really not lasting arrangements. For even among them, the seeming equilibria of position are the balanced effects of opposing velocities of change, molecular polkas and cotillions, that just equal one another. Besides they are far too simple in their physical constitution to be compared with the complexity of protoplasm. No memory and therefore no psychation could go far within the stark outlines of their atomic geometry.

The organization necessary for a continuous stream of psycho-activity must be something like that of a radio which registers on automatic records its experiences, to transmit them at the appropriate time and signal. But such an organization must also be capable of functioning as an internal combustion machine to keep itself alive. And that has been life's chief problem in evolution: to reconcile the incessant flux of its chemistry with the stability necessary for its psycho-activities. As the atoms of food particles that have been broken up by digestion and passed into the blood intermingle with the atoms of the cells, a dance of chemical reactions, a complicated ballet of metabolism, whirls them all into momentary partnerships and separations. These are reinforced by the tides of the molecular movements of absorption, osmosis and diffusion. The constant wear and tear of these reactions renders all the living molecules mortal. So they are continually being born, maturing and dying. An unceasing flux of

production, distribution, consumption and disintegration of living matter is being carried on in the tissues every minute.

But the cells of psychation, the nerve cells and more particularly the brain cells, those which remember past experience and integrate it with the present and future, must continue relatively unchanged and stable in their composition. Sustained by their colleagues in the body, they must avoid the repetitious tearing down and building up of their substance. For they must maintain intact those chemical formations which represent the material background of the dynamics of psychation, of learning and memory, of conditioning and association, of recognition and adjustment. They form and hold in their patterns the very stuff of consciousness. They must be preserved if the contents of the psychic life of the individual are to be preserved.

Brain has been the main accomplishment of evolution. More and more the brain becomes independent of the gross chemical adventures of its accompanying protoplasms in the cells, blood and other fluids of its body. The centralization of a continuous consciousness by persisting patterns in the material substrata of the brain does not happen by leaps and bounds. Only gradually, over periods of millions and millions of years, through numerous successive phases, was this underlying trend in the direction of evolutionary mutation finally realized.

The withdrawal of consciousness from the outer areas of protoplasm and its interiorization are accompanied by significant change in the local autonomy of the external tissues. An example is the body's loss of power to replace organs by regeneration. As the centralization of consciousness advances, the capacity for local self-regulation becomes more and more limited. Among worms, for example, where the head ganglia are mere pin points, almost identical with the other ganglia of the nervous system stationed along the entire segmented length of the animal, the tail will regenerate the head and the head will regenerate the tail, if one or the other is removed. Among the lower vertebrates such as the salamanders or lizards, the removal of a leg stimulates a reformation of a completely new one. Among the invertebrates, every separate ganglion, each co-ordinated center of the nervous system, acts like a center of consciousness. A feeding bumblebee will continue at its meal even if its hindquarters have been removed. Fighting ants will battle on even when they have been similarly severed from their posteriors. In all these animals, each part behaves as if completely independent of the others, because of the diffusion of consciousness throughout their bodies.

The centralization of psychation in the brain of the higher verte-

brates has increased the interdependence of the cells, tissues and organs, all the various body components. The influence of the thus concentrated psycho-activity enters into all its co-ordinations and makes possible its continuance. The tremendous advantage of this centralization lies in the increasing protection of consciousness which is conspicuously demonstrated when injuries at the periphery involve no profound or permanent interference with its psychic centers.

On the other hand, because of centralization of consciousness, injuries and poisonings, defects and diseases of the brain will cause immediate disturbances in the personality as a whole. Hemorrhages and clots may result in a loss of memories, of the power of recognition, of dealing with problems effectively or co-ordinating them. In certain infections and tumors of the brain there may even be a splitting of consciousness into different and conflicting selves or an abnormal alternation between waking and sleeping states. There can be no doubt, however, that the concentration of consciousness in the larger and more complex brains of the vertebrates has generated an intensity and quantity of psychation impossible with the older, more diffused system that the invertebrates possess, which has attained the limits of its possibilities in the fixity of instinct. To combine a dynamic equilibrium, a fixed balance of substances, with the potentials of variability in function and behavior, within the physical structure and chemical dynamics of the brain as the center of progress of psychation, has been the basic problem of the life-personality.

5. THE BRAIN AS THE INSTRUMENT OF PSYCHIC FREEDOM

The great French experimental biologist, Claude Bernard, once said: "The constancy of the internal environment is the condition of a free life." By a free life he really meant a free psychic life, that is to say, free consciousness. A free psychic life, a free consciousness, is and must be the first of all freedoms for protoplasm.

Cells composing tissues like muscle and glands, bones and skin, are bathed by the blood which is a mixture of oxygen, carbon dioxide, sugar, compounds of sodium and potassium, calcium and phosphorus, proteins and fats, vitamins and many other substances. These cells carry on a perpetual exchange of their own products with the blood substances. If the exchange of substances between the cells and the blood could be recorded minutely, they would exhibit a most amazing, continually kaleidoscopic, constantly shifting whirlpool of molecules and atoms. No cell of these tissues ever remains chemically the

same for two successive seconds, because of the resultant changes in structure and composition of their protoplasm.

The human and higher animal brain differs from all of these tissues in its ways of dealing with the variegated multiplicities of the blood. Though the brain has a higher metabolism than any other organ in the body, and therefore a greater need for oxygen, its own mode of nutrition is unique. For it has been so organized chemically that it needs only one substance: the sugar of the blood, glucose, also known as dextrose, to keep itself going. All the brain cell needs is oxygen and glucose. It will also use derivatives of glucose such as lactic acid. It rejects all else. Thereby its memory and psychic life are rendered immune to the charges and assault of the numerous and different molecules of the blood upon the material basis of its consciousness and psychation. It can thus preserve its memories in a continuous pattern which will not be disrupted by the forces which affect the chemistry of the other cells of the body.

Another characteristic of the chemistry of the brain indicates how the structure and metabolism of the brain have evolved together in the direction of the maximum of protection against physical and chemical disturbance. The active brain consumes the sugar of the blood constantly and the venous blood returning from it contains less sugar than the arterial blood entering it. But while the burning of sugar elsewhere in the body requires the presence of the hormone, insulin, as a catalyst, there is no such requirement for the brain cells. In diabetic animals the brain consumes sugar as efficiently as ever. The brain cells obtain their energy from the blood sugar by means of their own enzymes. Thereby they escape the complications of another phase of the energy releasing of other types of cells.

By these simplifications of its chemistry, the brain has emancipated itself from the destructive, the so-called catabolic, effects of the various chemical compounds which enter all other cells from the blood. The possibilities of breakdown of its psychic continuities, essential to the maintenance of personal or individual identity, by the tides of chemical change in its substance, become correspondingly reduced. Only when the brain cells become protected from variations in the chemistry of the blood can psychation and consciousness be freed from the mutations of replacement of their substances to which all the other cells of the body are subject. They can no longer be disturbed by the rush and ebb of the linked series of chemical reactions that provide heat and energy for their activities. Such is the amazing significance of the complex work of the brain, functioning as the

source of consciousness and the totality of unconscious psychation, and the relative simplicity of the arrangements for its chemical operations as an energy machine.

No one can deny that there must be a good reason for this simplification of the brain's metabolism. Because of such simplification to the utmost of the chemical reactions necessary for its energy requirements, its patterns of memory cannot be disarranged or confused by alien substances. Thus a basis for continuity of the personality is assured in a continuous memory. In all these respects the brain reminds one of the chemical stability of the germ cells, which are the carriers of the unconscious memory and unconscious psyche of the species. These must also be protected from disarrangement by the reactions of metabolism if the species characteristics are to be preserved and transmitted in a fairly fixed and stable fashion. It is significant that the reproductive cells of the sex glands which also have to preserve ancestral memories in their basic material patterns, also possess a similar simplification of their nutrition and metabolism: they feed upon sugar and oxygen alone.

The watchword of the evolutionary history of the brain then is a maximum of complexity of dynamic organization with a minimum of the conditions for disorganization. And similar considerations apply to its structural development. It undergoes the greatest part of its growth before birth and is in fact the largest organ in the body in the fetal stage. Subsequently, the total number of brain cells having matured, the number is final. Even after death of cells through injury or inflammation they are not replaced. The brain cannot repair itself as can other tissues. Repair of injured or infected brain cells would be of enormous advantage to an organism. But the disadvantages of upsetting and disarranging the basic purpose and design of the brain—the maintenance of the continuity of psychic organization—are so great that such repairs are not permitted.

6. THE INTERNAL ENVIRONMENT OF THE BRAIN

The simplification of the chemical dynamics of the brain is another and final indication of the underlying and persistent effort of the Life-personality to disentangle and liberate itself more and more effectively from the conditions under which it came into existence. The history of evolution is the history of the establishment of an increasing stability for the brain—i.e. psycho-activity. For the sake of the brain as its energy trapping apparatus, and its most effective instrument against the dangers and disruptions of the environment, the life-

personality, after many experiments, reduces the conditions of its preservation to a minimum. The growth and complication of that strangest and most mysterious of all the compounded substances of the universe, the gray matter of the brain, has become the focus of concentration of the whole evolutionary drive.

There are four environment hazards to which all protoplasm in general and the brain in particular are exposed: deficiency of oxygen, absence of water, insufficiency of food and the fluctuations of the energy content, especially the heat of their surroundings. The dependence of the brain upon oxygen, for example, is fundamental. No animal has yet existed without oxygen for its cerebral cells. And though there are certain lower forms of life that are anerobic and can live without oxygen, it is improbable that any higher brain ever will. Oxygen is a prerequisite of the first order for brain metabolism.

For the most ancient organisms living in the sea, surrounded by water with its dissolved oxygen and minerals and a narrow range of temperature variation, the conditions of perfect adaptation are at hand. There are for them no problems of extreme variation. So the protozoa possess immortality in a certain sense since they never die but simply reproduce themselves. But a many-celled organism immersed in the sea is constantly faced with the problem of the difference in position of its cells: those of its surface and those enclosed within. The latter cannot obtain oxygen, water or food as directly and simply as can the outsiders bathed by the circumambient waters. A device must be invented to permit the transfer of these necessities from the outside to the inside. For this purpose a system of tubes is elaborated, canals for communication between the inside and the outside, the sea water flowing in and out freely, and providing the same external environment for the interior as for the exterior.

As the many celled creatures evolved, their internal tissues specialized their functions, some as reproductive cells, others were set apart as muscles and nerves and nerve-muscle co-ordinators—ganglia. The problem of the centralization of the areas set apart for the preservation of experience and memory became paramount. The center of this integrative system and its ganglia assumed dominance in the head as the brain. The rest of the organism adjusted its structure to this brain in accordance with a principle of economic symmetry.

As the brain and psychation were thus segregated, it became more and more essential to provide for them an environment—an internal environment—less subject to peripheral change and instability than the external environment. In place of open corridors of communica-

tion with the external environment, a closed transportation system of nutritive and cleansing fluid, lymph, which later became a circulatory system of blood, was devised. It developed in close association with the organs of digestion and excretion. Sense organs responsive to changes in the distances around it were refined to give the organism better, more detailed information concerning the external environment.

When the first jumping mudfish successfully survived being stranded on land, the necessity for stabilization of the internal environment became even more pressing. In the waters of the seas and oceans, the variations of the external environment were dampened by the buffer provided by the very medium through which variations were communicated to the living organisms. But on land, heat and humidity, temperature and wind could vary enormously with direct exposure of the atmosphere to the rays of the sun and the vagaries of climate. Alternations in the external environment could change the internal environment much more precipitately and drastically for the land animals in actual contact with the planetary atmosphere than for the sea dwellers who had interposed between it and them the great sponge blanket of the oceans.

7. THE STABILIZERS OF THE INTERNAL ENVIRONMENT

As the vertebrates among the fish organized themselves in relation to a dominant brain, a series of new organs appeared, not present in the invertebrates, the function of which was to act as special mediators between the need for constancy in organism's internal environment and the fluctuations of conditions in the external environment. These organs are chemical factories of substances, the hormones, which regulate the interplay of the external and internal environments. They have become known as the endocrine or ductless glands. They include the pituitary and the thyroid, the pineal, the adrenals and thymus, the insulin-producing cells of the pancreas and the interstitial cells of the sex organs. In the invertebrates, at least one well-known hormone, a substance resembling or identical with that produced by the adrenals, adrenalin, is present and liberated whenever nerve activity is suddenly stimulated. But it is only among the vertebrates of sea and land that such localized and specialized cells emerge as definite organs whose duty it is, not only to step up or step down the general mobilization of energy for environmental situations but to control in detail the conditions of the internal environment. Against the disturbing currents of change they act much as does the gyroscopic stabilizer of an airplane.

All the fundamental chemical reactions of the cells of our bodies are regulated by the hormones of these organs. All these take place in a solution of water and salt like that of the sea. The same substances are also indissolubly connected with the problem of temperature regulation by which the land-living organisms protect themselves against the action of the sun's heat and light rays, which are, up to a certain point, necessary and advantageous to the organism's existence. By running the rate of its metabolism up or down, the amount of heat produced and the corresponding temperature may be regulated. The invertebrates accomplish this regulation by flushing themselves with salt water. The cold-blood vertebrates, the fish and the amphibians, keep in step with temperature variations in their external environment by running their own temperatures up or down in corresponding degrees by means of the hormones of their ductless glands. But still, such organisms are at the mercy of the environment and their bodily processes can be jerked from one extreme to another in a short space of time, and so can their brains and the flow of their psychic life.

Animals higher in the scale of evolution become warm-blooded when they co-ordinate the regulatory effects of their glandular hormones upon their metabolism by means of brain centers which work automatically like the thermostats of oil burners. These are set to maintain the blood and tissues at a temperature generally higher than that of the external environment. They are the stabilizers of the heat conditions of the internal environment. By varying the mobilization of the heat-producing hormones of the glands as they are needed, as well as controlling the distribution of blood to the skin surfaces or the internal organs, they achieve a most efficient control. Under normal conditions the heat retained cannot go beyond a certain maximum, nor below a certain minimum. If the action of the brain thermostats or of the endocrine organs becomes disturbed or inefficient, as it does in certain diseases, the precise balance of regulatory forces which maintains our temperature at 98.6° , within narrow variations, becomes upset. The warm-blooded animal then comes to resemble the cold-blooded in its susceptibility to a rise or fall in the environmental temperature, and corresponding interruptions of its psycho-activity.

By means of these mechanisms of the glands and the brain, warm-blooded animals have thus established a tolerance of heat which the cold-blooded cannot endure. In consequence of this greater tolerance of heat, the chemical reactions of the brain of the warm-blooded run at a faster pace and consciousness is more intense. Sleep, drowsiness, depression or inertia of consciousness, when psycho-activity is much

less sensitive, resemble hibernating or cold-blooded animals.

There can be no doubt of the dependence of psychation upon the temperature reflections of the speed of metabolism. Consciousness is dull and sluggish whenever metabolism is slowed. Within the range of the normal limits, there is a direct proportionality between the intensity of brain activity and the quantity of heat production. The psychic life of an animal subject to hibernation-like status or to similar fluctuations in the chemistry of its brain cannot evolve very far. So the invention of these glandular hormones and ganglionic centers for controlling oxygenation, metabolism, the generation of heat and temperature, and the chemistry of the blood in correlated fashion, co-operate for an increasing emancipation of consciousness from the varying conditions in its physical and chemical environment.

To circumvent the fundamental disruptions of the patterns of cells which would occur during reproduction, the brain, once formed by its billions of cells, never increases their number. Nor do they enlarge and divide as do other cells. The brain at birth contains the same number of cells as are present when it is fully matured. If it is injured and some of its cells are destroyed, they are not replaced by new cells made from the old, as occurs in other injured tissues. All this reveals the fundamental strategy of the life-personality in its dealings with the environment.

The brain cells enlarge with the accumulation of experience. In senility, when the brain cells shrink and atrophy, memory becomes poor and consciousness more interrupted by somnolence or sleep. But during its period of growth and maturity it enlarges as a result of the accumulation of experience by a progressively developed complication of the connections between the brain cells. A network of fibrils and filaments weave more and more intricately within themselves distinctive configurations which form the physical basis of psychic recognition and classification of the objects of experience. These too have to be kept undisturbed, although they are more physical than chemical in nature, and therefore more easily laid down or erased or displaced by education.

It is easy to see therefore why in the deepest layers and oldest patterns of the brain, where the chemistry of the maturation of personality takes place, the architectural positions of the substances which mediate unconscious memory, instinct and impulse, must be maintained intact. They are so maintained by walling the brain mass against the tidal waves of metabolism and buttressing it against the assaults of both its internal and external environment by limiting the

dynamic conditions of its activity to the least number of variable conditions. When these barriers are overcome, by chemicals or by disease, consciousness changes profoundly, sometimes to the point of insanity.

8. ILLUMINATIONS FROM THE INSANE

We are learning much from what happens when the sugar chemistry of the blood is profoundly altered in the insane. New methods of treatment of insanity have added to the evidence from anatomy and biochemistry as to how the brain cells have simplified their functioning to the lowest minimum possible. The dependence of the brain's psycho-activities upon its basic chemical reactions can be demonstrated by the consequences of interference with its sugar supply both in normal and abnormal individuals.

In the form of insanity called *dementia praecox* or schizophrenia, consciousness and the unconscious have become diseased together. An underlying weakness or inferiority of the individual has made it impossible for him to face difficulties of adaptation and conflicts of integration with his environment. Defensive deformations of his personality become morbid complexes, manifesting themselves as hallucinations and delusions, obsessions and compulsions, together with a refusal of social participation. Not only does the individual feel the natural isolation of his consciousness, but he has attained a true insulation of his innermost unconscious psychation from his fellow creatures. Such perversion of the relations of the self with its two realities is the essence of insanity, and bizarre and dangerous abnormalities of imagination and conduct are its by-products.

Morbid phantasies like Ophelia's madness cannot be ascribed merely to unhappy occurrences in a psychic void or to something that has developed in a mental vacuum, with no connection with body or brain. The continuity of the psychophysical personality makes it necessary to assume accompanying changes in the organ of consciousness and the unconscious. There must be new chemical patterns in the brain cells, relatively recent in their origin and formation. Though these are abnormal and destructive of the unity of the personality as a whole, they are superimposed upon the more ancient and stable structures, inherited or established in earliest infancy and childhood, the maturation of which determines the appearance of normal instincts and activities.

Under ordinary conditions, the human brain is the most efficient and least vulnerable organ of protoplasm and the life-personality.

Nevertheless, the flux of psychation is susceptible to any interference with the minimal supply of oxygen and sugar. Blood flows incessantly by way of its arteries to the brain, which abstracts some of the sugar and oxygen so that the venous blood leaving it always contains less oxygen and sugar. The arterial-venous cycle must be maintained if the individual's psycho-activity is to continue along its normal course.

The blood sugar is normally stabilized at about one tenth of one per cent to keep the supply for the brain paced with its conscious activities. When its concentration is reduced by the injection of repeated doses of insulin, which is capable of lowering the blood sugar to half or less of this percentage, the flow of psycho-activity of the brain becomes disturbed in various degrees. By means of insulin the blood sugar can be lowered in successive steps. By graded doses of it, beginning first with small amounts that can produce only a barely perceptible effect, and then increasing them to the powerful quantities that can drastically and rapidly reduce the blood's content of glucose to half of the normal, a series of changes in feeling, thought and behavior can be initiated. And when finally a certain critical lowering of the blood sugar is reached, the brain surrenders its consciousness and passes first into a deep sleep and then into a coma.

Even before sleep supervenes, signs of breaks in the hitherto smoothly flowing stream of consciousness become apparent, as the blood sugar drops below certain critical points. Changes in behavior similar to alcoholic intoxication may appear. Difficulties in the co-ordination of the muscles may show themselves first, so that the individual sees double and cannot adequately manipulate objects in his hands or use his feet normally. His mood may verge on the maniacal, or he may manifest a peculiar restlessness and irritability. His intelligence does not function as it should in matters of memory and judgment. All the currents of his consciousness are shaken by the seismic waves of disturbance generated by the insufficient oxygenation of his brain. But all these symptoms can be controlled and abolished simply by injecting sugar into a vein with a practically instantaneous response, or by administering it slowly in one form or another.

There is a certain co-ordination, too, between the sugar chemistry of the brain and the two streams of energy activity present in the brain, which recent instruments, that register the electrical currents and pulsations of its functioning, have recorded as also changed in the insane. One is that of consciousness, dependent upon a flow of electricity between its gray matter and the sense organs which keep

it awake and in touch with the environment. Lessening of the sugar supply to the level of sleep causes this stream of consciousness to disappear from the charts. The other stream of energy activity is spontaneous, indigenous to its own inherent psychation, unconscious since it is active even during sleep, as the first is not. It is abolished only by the most profound anesthesia and reduction of blood sugar to the very lowest possible level of its metabolism, that just above death which is what is seen in insulin coma at its extreme. Such a level of psycho-activity next to death cannot be sustained for more than a short time, for the variegated regulating, ordering, integrating and creative functions of the unconscious cannot be interfered with for long without dissolution of the delicate framework of balance and patterns by which the life of the individual is carried on.

9. SIGNIFICANCE OF THE BRAIN

From these remarkable correlations of the brain's chemistry and its psycho-activity one can draw certain conclusions about life. Such striking changes in consciousness consequent upon reshuffling of the protoplasmic variables in the brain indicate the extent to which psychation is subject to its chemical substrates and physical conditions. For the continuity of the stream of consciousness as well as of the stream of unconsciousness to be sustained without disintegrating interruption, a maximum of stability of these conditions is essential. Such stability is a prerequisite for both the continuity and complexity of the psycho-activities of an individual, since otherwise they would manifest their phenomena only spasmodically, in flashes as it were, like the deliriums of a man in a fever. No extensive registration or integration of experience or knowledge would be possible.

Therefore understanding the direction of the dynamic stabilization of the brain and its psychation discloses a principle which no mechanical explanation of their activities can explain. It is the law of the emancipation of consciousness, which determines the evolution of this series of stabilizing mechanisms in the internal environment of the brain, the lymph and the blood, and the organs which regulate the composition of the blood and lymph, the endocrine glands. These have become more and more efficient in their automatic regulation and restoration of the essentials of continuity and complexity, equilibrium and stability in the internal environment in the face of the reagents of change and disruption from the external environment.

The drive of evolutionary history has been canalized along the one direction of combining the maximum of complexity with the maxi-

num of stability to make possible the solution of the prime problem of the life-personality. That problem is the solution of the prime problem of protoplasm, the problem of organization. The solution of that supreme problem implies the resolution of many enigmas involved in the reversal of the inevitable degradations that lead to the ubiquitous disorganizations of death. It will have to be achieved ultimately by a brain with enormously greater analytic and synthetic powers than the human.

In solving its problems, the life-personality has concentrated upon the maintenance of two continuities: the continuity of the germ plasm, by which the line of movement from one generation to the next is rendered uninterrupted and the continuity of the psychoplasm, by which the line of progress from one brain to the next, the line of accumulation of experience, is kept unbroken. To achieve this continuity and freedom from disturbance of the patterns behind them, a similar kind of chemistry obtains within the tissues involved, the germ cells and the brain cells. The blood itself and the endocrine glands which regulate the chemical contents of the blood, water, salt, sugar, and so on, co-operate for the same effects. Through them too, body temperature is kept relatively constant, so as to prevent the disturbing action of a sudden rise or fall in the heat supply upon the stability of the germ and brain cells. Gross variations in the temperature or chemistry of the blood do not result in devastating disturbances of such body functions as muscular efficiency, digestion or excretion. But they do produce psychic derangements, lack of ability to concentrate, to focalize attention, to think logically, to make accurate adaptations. It would therefore be expected that a higher and higher type of psychation, could arise in organisms only *pari passu* with the development of a fixed internal environment and stable brain chemistry.

10. BRAIN VS. BELLY

A billion years ago the first one-celled animals, the protozoa, flourished. And as is now well-known, every human being begins as such a one-celled creature. The next step was the appearance of collective or colony-forming protozoa, which remind one of the stage of embryonic development called the blastula. Then instead of remaining merely linked in a chain of cells or bunched in a heap, creatures like *volvox* construct themselves. Most of the cells of these microscopic animals group themselves in circles, forming a hollow sphere. Equipped with very fine hairs or cilia, which, by a constant lashing

motion of its watery medium, keep it rolling like a hollow ball, the animal seeks and finds its food, and recoils and escapes from its enemies. Not all the cells of volvox are placed on the outside of the animal and devoted to its nutrition and protection. A certain number, the primeval sex cells, are deposited in the inside, consecrated to the preservation of the species-memory and so beginning to be safeguarded in the history of evolution. Volvox has a mouth and is represented in the embryonic story by the stage which in our development is labeled the gastrula (which we all once were). But no indication of a brain is evident.

The movement of organization passes on from the colonial protozoa like volvox to the porifera or sponges. Among them various cell specialists emerge, beyond the sex cells. Skin cells function as the ectoderm, and an inner lining of digestive cells compose the entoderm. And between them is a third innovation—muscle cells—grouped around the pores of the skin, which are the canals of communication between the external and internal environment. These muscle cells were destined to become devices of locomotion as fins and wings, hands and legs, and later of vocalization. A new way of attaining experience was thus brought into being. But that new mode of experience made necessary another invention, centers for co-ordinating the muscular movements with the sensory information that actuated them. Corals and polyps have neuromuscular cells with a sensitive spot at one end and a muscular fiber at the other, and free-swimming jellyfish have definite sensory cells in the skin, connected by a fine filament with a muscular cell in the interior of the body. Reflexes are thus mediated but no complex memory is possible until the special ganglionic cell, a newcomer in the total scheme of the now complicated creature, emerges.

These primitive nerve cells occur first as aggregates in independent stations, scattered about and set aside as timers, signalers and dispatchers, co-ordinators for complex adjustments needed in crawling, in tentacle waving and graspings and in making provision for their offspring. And in the next inevitable stage of progress, a consolidation of the scattered nerve ganglia merges them into a centralized system, the central nervous system, filaments of which branch out symmetrically. In this symmetrical pattern many of the nerve cells and fibers become united and concentrated in the frontal area, to make a brain in a head which carries the sense organs. The great adventure of the life-personality was thus launched upon a completely new phase of its history, a new mode of insuring its continuity. With the head and

brain at length in their optimal position for orientation to the environment to act as leaders for psycho-activity, vast horizons began to unfold. The complicated structures and instincts of creatures like the scorpions and spiders, bees and beetles, ants and termites came into being. And the higher crustaceans, the lobsters and the crabs and the prawns, and their cousins, the octopuses and cuttlefish and the pearly nautilus also developed. But at this point in the movement of the brain toward becoming bigger and better as the seat of psychation, a difficulty appeared, which threatened to result in an impasse.

The physical basis of memory in protoplasm is the tendency in living matter for the paths along which energy has traveled to become permanent lines of transmission of excitation. Every impact of the environment is essentially a movement of energy waves which pave a way for themselves along the directions previously laid down. Such channels of energy tend to become specific for the particular form of energy concerned. In turn, the specific channelization of energy leads to a structuralization of function. The particular energy chisels out, so to speak, definite tracts of excitation, transmission and discharge of its influence, which are ultimately transformed into distinct and specific structures. Energy organizes function and function organizes structures, which are finally transmitted in heredity. In response to these effects of energy, organisms build up patterns of structure. Thus there is generated the anterior-posterior pattern. Then comes a symmetry between the sides of the animal, a bilateral symmetry. And finally a symmetry of the upper and the lower parts, so a head end and a tail end, a right and a left, and an upper and a lower are differentiated.

It has been demonstrated by several methods that the energy in any particular part of an organism is highest at the point where it is being stimulated—at the head end as a rule. And as the energy recedes from the head it becomes less and less intense and the decrement or tapering of the energy intensity along the backward pathway is called the dynamic gradient. Two types of energy distribution in living systems find expression in the two modes of integration that accompany their evolution; one along the lines of dynamic gradients which create a nervous system and the other by way of transportation of chemical substances or hormones along the liquid channels, the glandular or endocrine system. Psychation is working all the time in connection with these two modes of co-ordination of the multiple-cell creatures. A unification of the organism is achieved by the centralization of all of these in relation to its psycho-activity in the brain.

Thus, by an action something like the architectonic effects of the tides upon the sands of the sea coasts, the dynamic gradients have formed the original type of nervous system which is a network of ganglionic cells. Over the surface of organisms possessing such network nervous systems are spread specialized points of reception of energy. These radiate and extend their modifications to the points of reaction in the interior, completing a circuit of finally re-established equilibrium. The tendrils of a sea-cucumber, for instance, receive the stimulus, which is transmitted by way of the tiny filament of nerve to the muscle fiber surrounding the bases of the tentacles. A muscular contraction follows and the energy balance is once more produced. These nerve fibers are distributed in what seems almost a haphazard way, because they are not grouped in strands like electric wires or copper cables. But after the head and head brain were evolved, the nerve fibers began to be gathered in definite pathways, bound together in strands like ropes or electric cables. And in organisms like the ordinary earthworm, a simple axial symmetry is provided by two cablelike cords, one running along each side of the middle of the worm, underneath the segmented food tube, and connected by a bar crosswise, until the double chain arrives at the head. There the largest accumulation of nervous matter converges as the cerebral ganglia. The ladder of rings around the alimentary canal ends with a terminal circlet of nerve fibers surrounding its gullet and a coronet of nerve cells associated with them in front of the mouth, the whole constituting the brain.

Now a dilemma arose, a dilemma of conflict between belly and brain so closely connected. These segmented organisms, with their ladder type of nervous systems, were driven to expand their brains, to assist them to find food in an environment in which the keenness of competition of innumerable hosts of their kin made food scarce. An insect like the spider developed more brains, accordingly. But the more brains grew, the more they encroached on the food tube, shutting down and squeezing its gullet and mouth. In the spider the brain has indeed become so large that there is very little room left for food to pass through the esophagus, not enough for solid food to pass. So he catches flies, sucks the fluid from their bodies and that fluid is his sole aliment.

Then something happened that cannot be explained according to a purely mechanical scheme of stratified dynamic gradients. It was the point in evolution, as Gaskell said, when living organisms had to decide whether in the future life would be a matter of belly or a

matter of brains. It seemed as if one or the other had to give way. Confronted with the choice of finally being starved to death by a hypertrophy of the brain, or of remaining stationary in evolution, the life-personality introduced a complete revolution in the design of its members. A new gastrointestinal tract was developed outside of and beneath the nervous system which continued to envelop the old food tube and incorporated it as part of its structure. And that is how the next and highest type of nervous system with its great brain and spinal cord, with its appendages of ganglia and plexuses, was created.

That brain and nervous system—characteristic of the vertebrates—are built around the old food tube of the invertebrates. Consequently the brain and spinal cord of the vertebrates are hollow organs. There are large cavities, lakes of fluid in the brain known as its ventricles, and a long canal, (the spinal canal runs through the length of the spinal cord) connecting directly with the lakes of the brain. Together they represent the remains of the old alimentary canal that was abandoned. At the base of the brain, behind the nose, there is the small but tremendously important pituitary gland, ensconced in its bony container. Right through its center runs a little channel which is the relic of the old gullet of the spider. And the conduit is continued to the ventricles through the stalk, the infundibulum, by which the pituitary is attached to the brain, like a cherry by its stem. There they are and will forever remain, reminiscent of the day when the conflict between belly and brain was decided in favor of brain, a momentous decision which made possible the gradually increasing size and increasing complexity and dominance of the brain in the course of evolution.

The discardment of the old gastrointestinal tract and the consequent emancipation of the nervous system and particularly the brain from its old limitations released the course of their development into organs of indefinite size and infinite possibilities. The old brain of the fish, the masterpiece of the old nervous system, became the under-brain, overlaid by the much larger masses of gray matter that are the new over-brain. The old under-brain continues as the brain of the instincts and emotions, operating closely with the internal organs, the viscera and the endocrine glands, while the new over-brain is the brain of ideas. It carries within itself an urge to infinite growth.

Brains of higher mammals and man are thrown into more and more convolutions, making them corrugated like a radiator. Thereby a much greater amount of surface area for the placement of more

and more nerve cells and their connections in the limited space of the cranium is secured. The gray matter of the convolutions of the over-brain spread out would occupy a surface of about three or four square feet, an immense surface considering the relatively small volume of the skull into which it is compressed. In the course of evolution, an organ has thus been created that apparently has untold capacities for growth and development. The other internal organs, the heart and lungs, the liver, spleen and kidneys, the stomach and intestines, even the spinal cord and the old under-brain, have probably attained for all practical purposes the limits of their expansion or differentiation. But the over-brain, so far as we can see, may and can continue to expand and differentiate, stopping at each new stage of complexity to attain a fresh stability, and then going on to a new complexity, and the alternation is an infinite series.

11. THE EMANCIPATION OF CONSCIOUSNESS

Even if the biological chemist should succeed in artificially creating life, his achievement would be valuable from only two possible angles of application: first the enlargement of the brain, the gross increase of its mass and size, and second, the production of the conditions of stable complexity for its functionings far superior to that available to present-day man. In time the contemporary and apparently irremediable isolation of individual consciousness and the insulation of the personality, the limitations dependent upon the susceptibility of the brain to fatigue and distraction will be changed. In the coming integration of the self there will be achieved an almost inconceivable simplification and efficiency of regulation and stabilization of the physiological and personal variables of the brain, the permutations of which still make human psychation so much of a blood relative of its animal forebears. There will follow union within the self, with his fellows, all of life and all of the universe. The conquest of death, which is the conquest of disorganization, will come within range of the actually achievable.

To achieve that most tremendous of all objectives, the human species, as the spearhead of the life-personality, must become conscious of itself as a single identity and unity, completely aware of its cosmic destiny. As the dominant animal of the psychic gradients which constitute the forward evolutionary movement, it has reached self-consciousness in the sense of becoming conscious of the links which bind it not only to the nether world of life, but also to the network which weaves the warp and weft of the human species as a whole.

and antinomies involved in the solution of the problem of death which is the supreme problem of life.

Last but not least in the scale of potentialities of these brains will be their capacity to resolve the fundamental conflict in man between his two selves and his two functions—that of his personal life and that of his superpersonal life, that of his limited self and that of his unlimited participation in the life of the god of evolution. His personal life, centered and bounded by his ego, is extremely limited, in order to prevent his psyche from being flooded by the totality of possible experience, just as his body and brain must be protected from suffocation and dissolution in the chemical whirlpool of his metabolism. His superpersonal life, the expansion of his conscious life into a reunion with as much as possible of that from which it is derived, life and the cosmos, hitherto starved and thwarted, is what will be and must be stimulated until it will operate in him as easily and naturally and continuously as his breathing or the circulation of his blood!

The most profound conviction concerning his relation to reality that can be attained by the individual or group is this: *That the individual and group are born, live and mature only to contribute to the increasing emancipation from its physical and chemical conditions of the life-personality which in turn evolves the interlocked complexity and stability of its organization for that most tremendous drive in the universe, the drive for the emancipation of all consciousness.*

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PSYCHIC FORCES IN LIFE HISTORY

OTHER CONSEQUENCES ARE TO BE EXPECTED FROM THE CONCEPT OF A direct evolutionary continuity, psychic as well as material, of all protoplasm. In the light of that continuity it should be possible to review the multiform modifications of living creatures from the standpoint of the participation of the psychic forces at work within them. If an organizing psychic energy has directed the changing forms of life in the steady interaction between organism and environment, internal evidence of its influence should occur and recur during the millions of years of its history.

1. PSYCHIC ELEMENT IN MECHANICAL MODELS

Certain criteria have long been used to distinguish and identify the psychic character of phenomena and events in contradistinction to the nonpsychic, that is to say, the merely mechanical. Yet it is not always as easy as it would seem to distinguish between them. The building of a house or the construction of an automobile are obviously the outcome of psychic impulses. All the well-known operations of a psyche are involved in the series of events that lead to their completion. The transformation of the energized craving, the stimulated imagination and the mobilized knowledge into the configuration of materials and mechanisms combined in a motorcar is an undeniable example of psychic causes and effects. Characteristic of the psychic process is the presence of the directing, co-ordinating and controlling influence of a driving purpose. Such a purpose employs materials and mechanisms in accordance with the laws of their nature and its own knowledge of them. There is always a certain rapport, or conformity of pattern, between the model of a machine, design or architecture as it first arises in the field of psychoreality and as it is finally materialized in the realm of physico-reality. The diagnostic criterion of this rapport between the psychic and the physical is that a whole of some sort is envisioned and realized.

In contrast, a shipwreck or a building destroyed by fire or an automobile accident are looked upon as typically nonpsychic, because they are traceable or attributable to the action of chance, the opposite of purpose. But if the shipwreck was brought about by a deliberate plot, if the house was set on fire by an act of arson, or if the automobile was tampered with before it left the garage, the element of chance is eliminated and is no longer considered a valid explanation. It indicates only that which cannot be included in the scope of a purpose—the psychic drive toward an achievement, the turning into reality of what is foreseen as a potentiality which can be directed toward actualization. The play of chance, in the old French sense—the fall of dice—is reserved for precisely that meaning: for that which is not within the reach of the lasso of intention. When the dice are loaded, the play of chance, the straight functioning of the laws of probability and average, is said to be interfered with by the psychic forcing of possibility toward a particular goal. Natural catastrophes, such as earthquakes, are the products of chance in that sense because they are not actuated or motivated by any such drive.

Now the application of science—systematically objective knowledge—to natural phenomena has tended to banish psychic forces and to limit study of things and events to the mechanical, i.e., nonpsychic, nonpurposive understanding of them. When the accepted scientific method is applied to an object or a process, the test of *intellectual satisfaction* is the mind's ability to fit it into a conceptual pattern, or the ability of the hands to reproduce it experimentally in material or mechanical terms. Nevertheless, as all such scientific knowledge is attained by a psychic process, it belongs in the end to the realm of psycho-reality rather than physico-reality. Something of the psychic remains imbedded in the heart of every scientific concept, every mechanical model and every experimental procedure. Generally the psychic element is ignored in all such products of research exemplifying scientific ideals. The result of the search for truth is regarded as successful only if its data can be described in wholly nonpsychic terms. Indeed the quintessence of this scientific method has consisted in interpreting the facts and laws of nature by a strictly anti-psychic logic.

So the advance of science has more and more banished mind from the universe of physico-reality. And science has won much of its prestige with this methodology. A certain justification for the attempt cannot be denied, for a profound transformation of society and civilization has followed in its wake. Whether one regards the

implications of its all-mechanizing endeavors with approval or not, the tremendous clarification that it has accomplished for the human mind will remain an eternal achievement. As a release from animism, which saw the psychic in every stray movement and accident in nature, it has freed mankind forever from baseless fears and errors and fallacious hopes and methods of dealing with the vicissitudes of life. When an earthquake is no longer regarded as the outburst of an angry deity, human sacrifices are out of order, and when an epidemic of infectious disease is not looked upon as caused by the agency of evil spirits, it may be prevented by a prophylaxis at the source instead of by the ineffectual propitiation of malicious nonexistent ghosts. Substitution of the logic of mechanics for the logic of the pseudo-psychic has been so triumphant an instrument of human advancement as to need no further vindication.

2. ANIMISTIC DOGMA SUPPLANTED BY MECHANISTIC DOGMA

The scientific logic of mechanics is the logic of machines. A cause produces an effect in the universe precisely as one part of a machine affects another, by an interlocking of the materials and forces involved. And as this ideology of machines became more and more extended it was applied as a matter of course to biology and the problems that science presented. Thus, in reaction against the sterile doctrine of vitalism, which depended upon the operations of a supermechanical principle like Aristotle's *entelechy*, this conception of the organism as a living machine, and of its parts and processes as being themselves minor machines became the ideal of the biological investigator. When Darwin came along and established natural selection as the dictator of evolution, ancient and decrepit vitalism seemed to have been delivered its death blow. Henceforth the logic of mechanics was to be enthroned as the guiding model of all research in physiology and psychology. The clue to life was sought in mechanical or chemical mechanisms constructed of inorganic materials.

In so far as this mechanical ideology, by its clarity and objectivity of approach, replaced the vagueness and the verbiage of the older pretensions to knowledge there was a tremendous gain. The vast accumulation of ascertained facts and measured correlations that compose the edifice of modern physiology and biology would almost be sufficient to convince the unbiased onlooker of the impregnable position of the logic of mechanics as applied to the manifestations of life. Moreover, there can be no question that every living organism contains machines and examples of the operation of mechanical

principles. For example, the bones of the skeleton and the way they are jointed, and the play of the muscles upon them are classic instances of elementary machinery in the human body. The efficiency of this mechanical apparatus is exemplified every time we walk, in the bending of the knees and the rotation of the hips. The diagram of the internal structure of any animal brings to mind the blueprint of any machine. This is firmly entrenched as the leading principle of nearly all the teachings and researches carried on in this field.

Yet it has been overlooked that the machine itself exists only in the human mind as an abstraction of the engineer's chart or the biologist's formula. Hands have constructed the blueprint, but there has always been a mind behind those hands. Like the tissues of the human body, machines function only in relation to human beings. They possess meaning as mechanisms only as extensions of the organs of the body and the purposes of the mind! As detachable organ-like structures, the various machines functioning outside the body might be called organoids, while the machinelike organs inside it might be called machinoids. Their common denominator, the one name under which they both can be subsumed and assimilated, is that of *vital functioners*: participants in the integration and correlation of the activities of a larger individual organized for the attainment of a purpose along a particular direction toward a definite goal.

3. ANALOGIES BETWEEN HUMAN AND NONHUMAN EVOLUTION

There can be no denying that the essence of psycho-activity is manifested in a self-directing and self-maintaining human personality. The inevitable question therefore presents itself: as the human-made machines are the mechanized products of the human psyche, could not animal and human organs themselves also be looked upon as the products and instruments of a more inclusive psychation, that of the life-personality? Psychic action can be inferred as functioning within all organisms as initiator and regulator of all mechanical constructions and activities. They are seen to operate in living tissues in accordance with the law of cause and effect, but in each case they are *teleo-mechanisms*, machines intended for an effect and working toward the attainment of an end point of purpose. The laws of their activity can be called the principles of *teleo-mechanics* and *teleodynamics*.

Man has not only invented machines, he has created works of art. One of the most striking effects of the diffusion of the doctrine of universal evolution has been its acceptance in human art as well as

in nonhuman nature. The idea of evolutionary change as first developed in biology and geology has spread to every realm and object that has a history. A serial picture has been worked out for the genealogy of every human production. Wherever human life has rooted and flowered, the onward movement of its mutations has been seen as driving ceaselessly as the flow of time itself. Where the prehistoric records of the rocks have left off for the paleontologists, the residues of the historic past, the temples and tombs, have repeated the tale of restless change for the archeologist. Historians have narrated the rise and fall of nations, donating to sociologists and economists materials for their studies of the transformations of groups and societies. All arts and cultures conform to the same pattern of inevitable evolution, of continuity from change to change. The principles of evolution hold alike for the human, the subhuman and the non-human. Time with its attendant, evolution, and its scavengers, decadence and degeneration, decay and death, labors with the same modes and techniques throughout all the ranges of life.

That the psychic life of the human individual grows and matures and degenerates in the cycle of his own personal history no one can gainsay. That the totality of human history similarly represents such cycles of the duration and activity of minds, of appetites, emotions, affections, desires, hopes, interests, and attitudes that can only be described as psychation or psycho-activity, must be equally admitted. Every exhibit of human life is permeated by a psychic quality which can never be ignored or verbalized away in nonpsychic terms, no matter what new technical phraseology may be invented. Moreover, no claim can be made for the limitation of psycho-activity to the human plane. Nor can it be said to have begun with any particular prehuman animal. No one can arise and say: Here is where psychic energy first appeared, and here is where it first became incarnate in organized matter.

4. INADEQUACIES OF THE MECHANISTIC DOCTRINE

How do we know we are alive? Because we feel alive. Consciousness, the sense of a feeling of life, is the criterion of the presence of some degree of psychic activity. And we transfer this feeling of being alive to all other beings which manifest other signs of being alive. No matter what hypotheses of the origins of life may be promulgated, and no matter where we put its beginnings—whether on our planet or some other—feeling is joined to metabolism as the criterion of its identification. Would something that metabolized without feeling

its environment be entitled to the name of life? To feel, to sense presences and absences, advantage and disadvantage, to orient and be aware, to remember and to anticipate—these faculties are as necessary parts of any definition of any living organism as is its ability to oxidize and synthesize protoplasm, to grow and regulate and reproduce itself. Some form of psychic activity or psychation, as we all know it, is as essential to any living system as is the exchange of materials and energies by its chemical machinations, the details of its metabolism.

Suppose the biological chemists, extending the frontiers of their stupendous researches, were finally to succeed in creating matter which metabolized like protoplasm. Would we recognize in such merely metabolizing matter something alive, unless in some way we could assure ourselves also of the simultaneous appearance of a most primitive elementary but essential consciousness? Psychic behavior as well as metabolizing function would have to appear in whatever structure the biochemists invented as an imitation of life before they could ever truly be credited with the creation of life.

In accord with their mechanizing predilections, the most recent scientific students of life have tended to concentrate on its metabolizing activities and to overlook and underestimate, the psychic aspects of their subject. Ever since Darwin promulgated the theory of the survival of the fittest, the investigation of bio-evolution has concentrated upon the influence of the external environment. It has come to be regarded as all-significant for the fate of the individual and the species. Less and less has become the interest in internal psychic influences. But that monopoly of the environment does not check with all the facts and problems of evolution.

These purely mechanical and mathematical methods of thinking and experimenting in biological research were bred by the wonderful triumphs of physics and chemistry in the understanding and management of the inorganic world. Their amazing results contributed to a charting of the cosmos as driven from atoms to universes by the power of nonpsychic forces. Much useful information was thus accumulated and a certain insight gained into the most intimate secrets of life. The early biologists relied too much upon the study of the gross phenomena of the living. Their methods were like the premodern observation of the symptoms of diseases without the aid of laboratory tests and checks. A logic of probabilities and deductions, such as Darwin used, provided results with a high degree of truth, but still somewhat speculative, without the certainty of physics and

chemistry. The nineteenth century was accustomed to rely upon such cumulative circumstantial evidence in the discussion of biological theory and law. The twentieth century turned to the direct test of its ideas in laboratory experiment which put an entirely new face upon the whole problem of mechanism in protoplasm.

5. THE PLAY OF CHANCE IN HEREDITY

A mathematical interpretation of heredity was one of the first fruits of the mechanical-experimental approach to the interpretation of biological facts. It concentrated upon the problem of individual variations in a species. Why the deviations of offspring from their parents in the various characteristics regarded as normal, such as the shape of nose, ears, or the color of eyes and skin? It was an amazing achievement, first of all, to trace them to chemical carriers that became visible in cells when stained under the microscope, to strange threads and rods of substance, the chromosomes of the nucleus, and their curious reactions and patterns of division and fusion in reproduction.

When egg cell and sperm cell unite at the moment of fertilization there is paraded a stylized arranging and procession of these chromosomes. The chromosomes from the male and those from the female separate and march to opposite poles of the cell, like the partners of a cotillion, then march again to meet and fuse, but they do not diffuse into one another. Each retains its identity, splitting lengthwise with every cell division of the original fertilized egg, so that within each and every one of the millions of cells of the mature body formed out of the original male sperm and female egg there is retained a portion of its two progenitors, with no true mixing of them, and the total number of chromosomes remains the same and constant for each species. The cells of the human body, for example, possess 48 chromosomes—24 in pairs.

In the next generation the egg cells and sperm cells contain a similar set of chromosomes. Consequently, before an egg cell or sperm cell of a mature individual becomes capable of fertilization, the number of chromosomes has to be reduced by one half, otherwise there would be a doubling of the chromosomes in each generation. A confusion of the species' pattern would follow, which would destroy it in one generation. A reduction to one-half the number characteristic of the species is necessary to preserve that pattern. Such a necessary reduction of the number of chromosomes characteristic of the species occurs within the reproductive cells at a certain point in their development within the reproductive organs. Each of the maternally and

paternally derived chromosomes interlock just before this reductive maturation so that none of them, as chemical representatives of specific organs, will be lost. They come together, they pair; then a splitting takes place, and half the resulting pieces are extruded. After this reduction division, as it is named, with its remnant of one-half the number of chromosomes specific for the species in each germ cell, separation again occurs. When sperm and egg now meet, the full number of chromosomes is restored by their union. The structural features of its germ plasm peculiar to the individual of each species are thus preserved. The hunger of sex is thus literally an urge for completion, for the restoration of the original balance of the chromosomes.

The constituent particles of the chromosomes, the genes, are the fundamental units of heredity, as the atoms are the units of chemistry. The position and number of genes are the basic determinants of the inherited characteristics of individuals and species. The genes might be compared to the cards in a pack which are shuffled and dealt: each individual must play out his destiny with what is allotted to him. The whole chromosomal machinery of inheritance, as elaborated by the students of genetics, has added immensely to the prestige of the doctrine that life itself is only an extremely complicated machine governed by these same statistical laws of chance. The upholders of a purely mechanistic doctrine of life point to the dance of the chromosomes and the shifts of the genes as supporting evidence, and the fact that the elements of chemistry and chance rest at the very foundations of life reinforces their belief in a biology and psychology of pure mechanism.

Around the constitution and position of these genes in the chromosomes have centered the dynamics of the long evolution of living organisms as species. Through their mechanical transformations, effected by drastic reagents of change, either physical, as X rays, or chemical, as radium, acting upon the germ cells of individuals have been produced those inherited variations of families which become the true mutations of protoplasm and the starting points of new species. Such mutations continue steadily but slowly and with many transitions between the like and the unlike, between the older and the newer species. Then, as they struggle among themselves for survival, or as the environment struggles with them, an annihilation of a whole series of transitional mutants follows. Mutations that are lethal to the individual of course wipe him out at once, sometimes even during embryonic development. But a mutation, which has proved favorable

because of its fitness for the environment may result in the founding of a new line of differentiation and a new species. The large differences of species and the long steps of evolution have thus been achieved. But the contention is that the evolutionary process is achieved only by the mutations as they turn up arbitrarily and fortuitously in the fall of the cards. A trump card—a favorable mutation—appears only according to the laws of chance or probability. For the cards are dealt by no single dealer, but by a thousand and one, indeed the countless combinations of circumstances and causes we call the environment. And the action of the environment is really the expression of the average effect of a number of reagents which both change and select the genes and the chromosomes that will survive for further propagation and differentiation.

6. CONTROL OF CHROMOSOME VARIATIONS

The search for a purely material theory of evolution has been a search for a mechanical and nonpsychic explanation of it. Together with it an anti-psychic explanation of life itself, and with life, of the cosmos, is regarded as the most desirable goal of all scientific effort. Such an explanation is considerably buttressed by the establishment of chromosomal mechanisms of sex which may be co-ordinated with the Mendelian laws of the hereditary transmission of unit characters. In these the dominance or submergence of a species characteristic, such as color, operates on a mathematical basis predictable as an expression of the laws of chance. Both seem to provide an immutable foundation for anti-psychic doctrines in biology as in physics and astronomy. Accident and arbitrary chance also had their own way even in the atomic depths of the physics and chemistry of the germ cells. As the reproducing cells are the only living links between generations and species and therefore transmit not only the physical basis of heredity but also of evolution, there was no room anywhere in the chain of causation for anything like psychic action.

Interest in the problem of the evolution of species has now become directed toward the mystery of how one kind of chromosome or gene is changed into another. Therewith the problem has been transported to a different level. For it becomes a question, not of how one fully developed creature has been transmuted into another and different fully developed creature. The problem is carried back to the beginning of beginnings, to the reproductive cells, and to the various substances and energies operating in them. Ever present and active in the cells, tissues and organs of the individuals possessing the specific character-

istics of their family and race, these genes and their chromosomes constitute the matrix for any genuinely satisfactory genetic analysis of evolutionary history. A host of workers have contributed to the science of genetics which deals with this problem. Variations among individuals of the same family have been analyzed as changes in particular chromosomes and genes in respect to their own chemical composition, or in respect to the constitution of other associated chromosomes and genes. Most of the work has been done on the fruit fly, which can easily be bred and studied in the laboratory. But the essential facts and principles discovered are believed to hold for all living organisms, including man.

7. INTERPRETATION OF EVOLUTIONARY SEQUENCES

It would have gratified such philosophers as Lucretius and La Mettrie, apostles of the machine conception of life, to have known of these feats of chromosome manipulation. Powerful contributions to their mechanical conception of life, they would have considered them incontrovertibly proved, in fact. Nevertheless, in spite of these triumphs, fundamental objections to any merely mechanical theory of evolution like that of natural selection still remain valid. These objections center around the fact that no one understands why the small, gradual variations of these chromosomes, supplying the material upon which natural selection acts, should accumulate advantageously along one particular direction in the course of generations.

Most variations between the characteristics of parents and offspring are useless until they have become fully developed for functioning as useful organs. All indications stress the principle that the actual processes of natural evolution—progressive evolution as it has occurred throughout the ages and not as it has been forced in the laboratory—have followed along definite lines toward specific goals. No explanation of such evolution can be considered finally satisfactory unless it includes an explanation of the persistent direction taken by those mutations or variations which function usefully and with greater and greater efficiency in every generation until they have reached an end point of effectiveness. The persistence of trends in important mutations, from point of origin to point of fulfillment, continues to be the supreme problem of evolution. For it is these mutation trends which are decisive for the distinguishing differentiations of species. No matter how slight or feeble at their incipency, it is the maintenance of such trends that creates the marvels of adaptation. It is

the instances of such an undertow of the persistent movements of evolution, which are manifold, that are the most interesting and the most indicative of the forces underlying and really determining which way the particular development is to proceed, forces which are primarily psychic in nature.

One of the most striking of evolutionary products is that of the eyes. A pigment spot, evidently capable of registering light vibrations, can be observed in the most primitive organized animalcules known, the protozoa. It turns out to be the precursor of the organ of vision. The evolution of the eye exhibits the continuity of a psychic striving to attain an organ of vision constructed from a similar pattern of tissues in creatures as different as the invertebrate octopus and the vertebrate bird. The mollusks and the vertebrates are very different branches of the family tree of life with quite different positions and arrangements of their organs. In the cuttlefish, for instance, the eyes are present in the mouth, surrounded by the tentacles, while in the vertebrates, they are placed at the sides of the head in front of the fore limbs. Yet the eyes of both are built along essentially the same lines, as if according to the specifications of the same underlying plan: a retina, with pigmented cells sensitive to the light is placed in the interior of a firm-walled ball, a partition dividing the ball into two chambers. An opening in the partition contains a lens, and a set of muscles regulate a diaphragm, the pigmented iris or pupil. In the octopus the eyes are formed out of the skin, while the vertebrate eye is predominantly an outgrowth from the brain. If one follows the steps of their development in their respective embryos there is revealed the recurring marvel of similar organs in different animals—organs that have been finally arrived at as the achievements of some constantly driving, apparently purposive agency acting from different starting points and working along different directions to accomplish the same end result.

8. THE PRINCIPLE OF AUTO-SELECTION

Thus, the inherent evolutionary drive of adaptation works itself out like the completion of human invention, many instances of which may be cited in which an idea or urge evidenced in a rudimentary apparatus becomes progressively improved and finally completely realized after passing through various stages of experiment and modification. Starting with a mere sensitivity to light vibrations, the elaboration of the eye continued until it had completed itself, producing not a perfect instrument but one that has attained, after a

long period of time, the limits of biological adequacy in many different species. It illustrates perfectly how throughout the range of biological organisms, possibilities have been exploited along directions of persistent movement toward a long sought for goal.

Such realizations, polarized with the flow of time in the course of evolution, have devised the myriads of varied, and plastic tissues, forms and functions that adapt the living to the environment so adequately. Their character cannot be explained away with the concepts of inorganic physics, chemistry and mathematics. Without an inclusion of the fundamental psychic drives in living matter—drives which are specific to it, in the sense that they are not possessed by the non-living—the sweep of the evolutionary movement can never be understood.

Protoplasm, the matrix of life, is a substance singularly sensitive, responsive and plastic as no known chemical compounds or mixtures are. It also possesses the specific property of reacting to an environment as if it functioned constantly with a sense of itself as a whole, which is the psychic sense par excellence. Psycho-activity, awareness and response dominate its growth and metabolism. Sensitivity, metabolism and growth are all involved together in every living process. Their collaboration has been demonstrated even in stationary plants or sessile animals and must be postulated throughout the evolutionary series in virtue of the law of continuity which connects them with the higher animals and human beings whose activities are known to originate in the psychoreality of their brains.

A psychic discrimination, a differential sensitivity to the contents of the environment, the capacity to select that which is good, useful or satisfactory in some way, and to reject that which is not, is the outstanding phenomenon of the performances of the living, from amoeba to man. This law might be called the principle of auto-selection. The protoplasmic organism, the dynamic living creature, selects, just as environment selects, and in fact in a much more precise fashion. For while the environment, as natural selection, merely eliminates haphazardly and blindly those who cannot meet the stress and strain of the conditions they encounter, protoplasm chooses steadily and inexorably and moves firmly and resourcefully along the direction it has taken. It persists in its strivings and accomplishments in spite of all that the environment, favorable, hostile, or indifferent can do.

In the working of auto-selection are observed manifestations and qualities that remind one irresistibly of what we are accustomed to identify, among human beings and creatures constructed more like

ourselves, as psychic in nature, evidences of feeling and effort, trial and error, insight and revision, with steady pressure toward an objective. Such manifestations are always accompanied by an awareness and manipulation of the self or individual as a whole, vague at its primitive level. Yet it is an expression of psychation in its simplest manifestations, and unquestionably akin to consciousness and psychic life as we recognize these in ourselves.

These psychic characteristics of life, distinguishable as sensitivity, desire, memory and anticipation, persistence and satisfaction, disappointment or fulfillment, are general possessions of all living things. They are observable in the protozoa, in the most primeval representatives of the life-personality and in the behavior of their descendants and offspring. In all the fully matured members of every species, they can be seen at work in learning and conditioning, in the acquisition of habits, in the trials of problem solving, in the growth of intelligence as it evolves as the psychic organ of analytical self-control and self-realization. They include the pains and pleasures which act as the affirmers or contradictors of the organism's psychic experiments and so the whole of the experience of the lowest vertebrates and invertebrates, as well as the wit and wisdom of the most cultivated and differentiated human beings.

It cannot too often be repeated that these essential psychic characteristics of life cannot be assimilated or dissolved in any simple mechanical scheme or pattern. They are materialized and symbolized in all the multitude of structures and functions of protoplasm that have arisen in the course of evolution. While the metabolic properties of life can be followed in terms of the automatically emerging cause and effect patterns and reactions of its physical and chemical constituents, other significant and specific features of life, such as discrimination of the contents of the environment, the assimilation and organization of experience leading to the maintenance of organism as a whole and the integrity of the self at all costs, and the autonomy of self-regulation and self-reproduction, are all associated with those specific properties of activity which can always be recognized as the psychic. The powers of the latter are no more to be denied their presence in protoplasm than the former. Both must be studied and understood, and their mutual participation in the adventures of the life-personality objectively admitted and evaluated.

Auto-selection must be given the credit for most important contributions to the history of evolution. The serial spectacle of evolution has to be perceived as primarily a succession of psychic events in

the progressive self-modification of protoplasm, and the participators in it, as psychic agents, of memory, awareness and will.

Orthodox narration of the evolutionary story makes it consist of merely mechanical mutations of structure and function. It is a moving picture of what happened to happen, the fortunate and unfortunate variations and mutations, the chances of heredity that decided what new species would arise out of the old. It is the tale of an idiot blundering along as luck leads him, a machine without a master.

The strange and curious processional of evolution can and must be pictured as a succession of inventions and discoveries, adventures in construction and reconstruction, the outcome of a psychic selecting and making the most of what chance has turned up for it. This is a description utterly inapplicable to the changes which have occurred in the different strata of the earth's surface or the metamorphoses of a series of interlocked chemical reactions, though these may be included in a concept of inorganic evolution. Forever underlying the new appearances of the different forms and activities of life there operates this principle of the strivings of auto-selection and auto-direction. Moreover, these unique sensing and responding, discriminating and organizing powers of life also become more powerful as it evolves. As they become more efficient, they become more and more important and more and more effective in directing the line and figure of the total movement. The balance becomes shifted between the psychic and the mechanical as organisms progress until the psychic becomes predominant.

9. PRODUCTIONS OF PROTOPLASMIC LIBIDO

With all due homage to the magnificent achievements that have been made and will yet be made in the scientific study of mechanism in the living organisms, there is no need to conceive of life as enslaved to it. Apart from all the evidence for the place of psycho-activity in the functioning of elementary protoplasm such as Jennings demonstrated among the protozoa, there always remains the fact that in the ascent of species there has also occurred a parallel and progressive psychic evolution. An increase of the psychic power and efficiency of co-ordination and control, which can be called the influence of psychation, has accompanied the cumulative anatomical and physiological mutations of individuals and varieties.

When new organs and new tissues present themselves, it is as if they were the realization of possibilities and potentialities, much like the changes introduced into the pattern of an invention or the plan

of a discovery by the human mind as it goes on from its first conception to complicate and modify it. Mechanism is there, but it is teleo-mechanism, an arrangement of parts interacting strictly according to the laws of physics and chemistry, but pervaded by a sense of the whole, designed and striving for the conservation and perfection of the whole. The process attains its climax in the achievements of the brain which is both mechanism and psychic organ.

Every one of the essential organs of living beings has been contrived under pressure of problems that definitely directed psychic drives. The elaboration of an unmistakable mouth, for instance, one of the earliest organs, is preceded by the appearance of a mouthlike orifice for the entry of food and drink in the protozoa which might be named the expression of the alimentary drive or libido. Similarly, the organs of excretion seem to express an eliminatory drive; nerves and muscles appear as the expression of a kinetic drive toward integration; the sexual system, as the devices selected for the workings of the reproductive drive, or the sexual libido. Anxieties of protection, defense, aggression manifest themselves in the manufacture and selection of walls and barriers, weapons of offense and retirement. Taken together, all are seen to be the apparatus of working solutions for situations that had to be met or urges that could not be gainsaid.

This does not imply that these were the creation of definite conscious purposes and concepts, as human inventions and discoveries are understood, but they were, at the various psychic levels of evolution, their equivalents. All these changes are subordinated and coordinated by the one underlying law of the preservation of the organic integrity of the life-personality and its concomitant principle of self-regulation and auto-selection which can never be completely comprehended without taking into account the cohering, unifying and polarizing action of the psychic forces within.

Any really comprehensive and valid history of evolution has to take into consideration the psychic attitudes and reactions, unconscious and conscious, of the living being toward its environment as dominant in determining its behavior and its modifications. Their presence in the living and their absence in the nonliving determine contrasts overwhelmingly great. The simplest name for these psychic attitudes has been feeling. Feeling becomes interest, desire, attraction, love, or their opposites, indifference, aversion, repulsion or hate. *Protoplasmic libido* is perhaps a suitable designation for it. These feeling reactions of the living, the feeling of satisfaction or lack of satisfaction, of success or failure, of frustration or confirmation in an

attempted effort or movement have been the most effective stimulants or depressants of their adaptations to their environment, in learning, in habit formation, and in total co-ordination of all behavior. So they must prove tremendously significant for the dynamics of their evolution.

Looked at physiologically, the effect of such an elementary feeling must be imagined as an organic growth or patterning of some sort, the precise nature of which the ingenuities of experimentation will have to discover. The effects of such organic growth or pattern are diffusely transmitted throughout the cells of the creature and through all its media. These functional modifications conduce to hypertrophy of certain tissues, and to the atrophy of others, and they are known to occur in nerve fibers and muscle segments, in bones and ligaments, in fact in all the tissues of an organism, following regular increases or decreases in blood supply. A persistently acting emotion produces just such changes and their concomitant anatomical and structural mutations.

Moreover, if the emotional reaction is strong enough, the reproducing germ cells, the chromosomes and the genes composing them might also be modified somehow, if only slightly, since they are not confined in a vacuum, but exist in the most intimate contact with the body fluids and substances. If the effect of the protoplasmic libido persisted from one generation to another, even without a constantly acting environment, these responses, active within the innermost depths of the protoplasm, transmitted to molecular and atomic levels of expression, would register in changes of the chemical and physical constitution of the genes and chromosomes, as the more massively and directly acting heat waves and radium rays, X rays and cosmic rays have been proven to be capable of mutating them.

As the possibilities of sensory discrimination improved, as sensitive contact, smell and taste, vision and hearing were evolved, more and more of the material of experience would be provided for these physical registrations of the psychic needs and satisfactions of progressive individuality. As increasing information about the environment broadened the scope of consciousness, it enlarged both itself and its world in a variety of dimensions and intensified the range of its desires. These libidinous reverberations of experience would make at first for the appearance of a great many more forms and a great many more variants among the living. And that is the record: the evolutionary libido proliferates remarkably out of the simple lives of the one-celled protozoa into the tremendous experiments of the echinoderms and

the mollusks, the vertebrates and the anthropoids. These branchings of life, with their queer shifting of patterns, yet underlying similarities of structure and functioning, represent at bottom psychic solutions of the riddles of the environment by a libido that accumulated experiences and memories. The basic impulse of life was to accumulate and organize such experiences.

10. IMPORTANCE OF MEMORY IN LIFE PROGRESS

How does this structuralization of psycho-activity, this incarnation and incorporation of its experiences into the architecture of an organism occur? Psychic experience means growth of substance, it can safely be assumed. The deposits of such experience, various modes of memory, result in the organization of such substance. No simple creature like an amoeba or paramecium was capable of either growth or organization on any scale. No complex memory is possible without a conservation of substance arranged in structure and pattern. Because of the ever-changing metabolism of protoplasm, with atoms swinging from one cell to another, the circular flux of assimilation and breakdown makes for a marked limitation of growth and its consequences. Its psycho-activity is also held within narrow bounds of size and surface. So it became necessary to provide an area of expansion, of continuous growth of its memory, which would not be swept away by the tides of metabolism. That area functions first as a nervous system and then as a brain, the organ of relation and co-ordination through learning and memory.

Sensitivity is a primary characteristic of protoplasm. Sensitivity condenses into memory. The energy of memory arises out of the great reservoir of psychic energy, psychergia, energy of psychation, that drives the protoplasmic libido. Stability of memory is as absolutely necessary for the psychic functioning of the individual as stability of the genetic materials is necessary for reproductive mechanisms. Both need a certain degree of immunity to the kaleidoscopic changes and mercurial exchanges of metabolism. The setting aside of a class of cells as the gray matter of the brain, for the storage of psychic experience corresponds to the specialization of another group of cells, the germ cells, for the transmission of the relatively fixed characteristics of the species. Both types of cells have the highest metabolisms and at the same time the most stable metabolisms, because their preservation is most precious to the individual and the species.

Memory is based upon some imperturbable stability within the restless fluctuations of the life process. That has been made clear by

the studies of the chemical reactions in the organ of memory, the brain, admittedly the most complex and the most efficient of the body. Out of the many possible foods for cells supplied every second by the circulation in the blood of a variety of chemical substances, the one which the brain has selected for its food and fuel is the simplest of them all: sugar, the glucose or dextrose passed directly from the liver into the blood. In consequence of the chemical simplicity of their reactions to the blood sugar, the brain cells which become affected by experience preserve the memory patterns deposited within them and remain intact. Such is not the case with the intense chemical reactions of metabolism which might be likened to silent explosions as they occur in other cells. Such protection against disturbance of memory traces occurs in no other tissues of the body, neither in the muscles, the skin, the bones, or the gland cells. It is only when the brain cells are permanently damaged by a hemorrhage or by a difficulty of blood supply, or by a disturbance of their chemistry by drugs or senility, that memory is lost or degenerated. No fact is more significant for an understanding of the meaning of the psychic history of evolution.

Memory itself is indeed a form of reproduction, and reproduction without memory is inconceivable. An unconscious psychic memory as the background of the continuity of the life-personality, is visible even in the recapitulation of the generations that takes place during embryonic development. The special mechanisms of memory in the patterns of nerve cells and filaments, ganglia and plexuses in the gray matter that finally becomes a brain, make possible the better hoarding of experience. If the first law of life is self-preservation, that law operates first for the preservation of consciousness, then for the preservation of memory, and last for the preservation of the species.

By means of its auto-selection, the organized psychic energy within organisms invents, discovers and creates the variety of self-sustaining and balanced structures within living things. A living creature possesses style, composition and form, like a work of art. The multiple dynamic symmetries of evolution are among the most striking manifestations of the libido behind all multicellular vegetable and animal varieties as they unfold in life history. Psychic energy, like all other energies, is a form of movement akin to heat, light, electricity, radiation of every kind. But whereas theirs takes place in shapes that are rigidly unfolded, or in undulations, vortexes or spirals relatively fixed in their range, it is characteristic of psychic energy that it is inherently organizing, pattern-making and architectonic in relation to the others.

Psychergia may be defined as an organizing and reorganizing form of motion. Consisting, perhaps, of the shortest wave lengths in the universe, it is specifically manifested in its patterning effects, of which memory is the most subtle and observable, and form the most gross and obvious.

11. ANALOGIES OF ART AND THE FORM-MAKING IMPULSES OF LIFE

The form-making achievements of psychic energy as manifestations of the protoplasmic libido can be studied most fruitfully in the poetic constructions of the mind of man. In his toolmaking and in his machine making, as well as in his art making, in the building of his houses and sculptures, of his language and music, his paintings and his dances, his psychic energy has exhibited its form-creative drive. The law of continuity which establishes the identity of his substance and metabolism with that of his protoplasmic progenitors, his animal ancestors, must extend also to these activities of his psychation. Though the intensification of his consciousness and the introduction of ideas into his psychoreality single him out as superior in his creations, they hold much in common with the similar artistries of animals which are said to be the work of instinct. The making of nests by fishes and birds and mammals for their young, the construction of their homes by insects, the amorous songs and dances of birds, bespeak the same pattern organizations of psychic energy, structural or functional, static or dynamic, that are manifested in the art of human beings. One single form-making impulse is to be observed throughout the realm of the living.

There is a vast difference between organic form and inorganic form, between the six elementary classes of crystals and the six great groups of the Linnean classification of mammals, birds, amphibians, fishes, insects and worms. The latter unfold themselves in their evolution in a way that is irresistibly reminiscent of the evolution of human tools and machines. The devices and discoveries of animals and plants are the effect of the vaguer psycho-activity working more slowly and haphazardly, than human psychation. Many human discoveries and inventions have, however, long lain dormant in a similar fashion before being applied.

Psychation in animals strikingly differs in its formative achievements from that of man because of the organic inseparability of the changes of substance it produces from the vital depths stirred by them. Organic evolution has probably ceased in man, because he has become a toolmaking and tool-using, a machine-making and a ma-

chine-using animal. The impulses and needs which would have gone in the course of generations to the modification of his flesh and blood and brain have been expressed and transmuted into that marvelous diversity of accessory organs that fill man's workshops and his homes, his laboratories and his highways, his factories and his farms. Because they are subservient to the amazing plasticity of his nervous system, the speed and variety of their evolution have changed the face of his life as that of no other species has ever been changed in a similar space of time.

Machines are detachable, non-protoplasmic, noncellular parts of himself, and so progressive mutations, improvements in them, can be selected from one year to another. They need no representatives in the germ plasm, but they do have idea representations in the psychoplasm, the configurations of the brain. But just the same they are the last productions of the form-making impulse that runs through the whole scheme of the living, from the oldest to the newest species.

In the making of machines and instruments, however, there is a degree of deliberateness, a conscious matching of parts, a certain foresight of the ideal finality. If it is analogous to the psychic auto-selection and direction motivating the genesis of important organs in evolution it is also markedly different in its awareness, its visualization of the satisfactory construction of patterns. It is true that the technical inventors of machines and the trained discoverers of scientific instruments have testified that, after long groping and much failure, something seems to surge from the lower depths of their psyche and solves the problem. Not consciousness, but intuition, is credited with the result, and sometimes dreams play a role that is decisive for the solution. Yet there can be no question that here exists the largest amount of deviation, almost a qualitative difference, between the human psyche and the subhuman, animal-plant psyche.

In another field of man's activity, in the creative efforts and attainments of his art, a close kinship, like an intermediate link between his psychic life and that of other species, may be found. Art has been just as much of an organic development in human life and history as has technology, the invention of instruments and machines. While the analogy between the latter and bodily organs is easily apprehended, the similarity between art impulses and biological impulses and productions is even more profound. Both point most directly to a common psychic causation. Rooted in the same soil of desire and interest, they are much more alike in their primitive motivations and

in their original rudimentary modes of expression. Similar considerations apply throughout the animal world and its constructions.

12. EXEMPLARS OF PSYCHO-EVOLUTION

In the growth and maturations of types and schools of human art, certain ideas emerge, expand, culminate in a crescendo of production and then obsolesce in the face of new conditions without, new psychic tendencies, new feeling and desires within. A crude beginning refines and perfects itself, later becomes ossified in tradition or distorted into extravagances. Human techniques are a prolongation and extension of the evolutionary movement of the life-personality.

European primitives matured in the perfections of the *quattrocento* fruition of Italian art and then degenerated into the later phases of the fantastic extremes of baroque. The stiff, solemn figures of the Romanesque and Gothic artists pass into those of Granach and Baldung, which became the flowing line of Dürer and Holbein, Giotto and Montegna. After them Da Vinci and El Greco create the masterpieces of a whole movement toward an apogee of form and color harmonies, a climax of European culture. Then, as if fatigued and bored with their beautiful simplicities, the baroque and rococo break their lines into more fantastic irregularities and voluptuous amplitudes that combine giantism, minutism and decorationism into an apotheosis of luxury and pretentiousness. The excesses of that spirit preceded the French Revolution of the eighteenth century and died with it, exhausted by the decadence of its creative impulses.

The ammonites, whose only modern relative is the cruel blood-thirsty pearly nautilus, swarmed in the Mesozoic seas. They lived in long conical shells, which became curved and then coiled. They walked on their hands and carried on their backs their mineral-walled houses, chambers coiled within chambers. For millions of years they preserved the patterns of their beautiful spiral structures from one generation to the next. And then their classic sculpture seems to have bored them, and a secret desire to have destroyed their beautiful symmetry. A note of the bizarre and the fantastic like that of the extremes of baroque art entered to spoil the products of their latest generations. Volute forms, spines and pustules, like the excrescences of decoration and ornamentation that spoil the pictures and furniture of rococo became the prelude to their disappearance off the face of the earth. Heralds they were of a psychosis of the creative energy, like the dadaism or surrealism of recent painting.

The titanotheres, creatures whose fossils are found in the rocks

of the Tertiary, looked like the rhinoceros of which they were the ancestor. In their first generations they exhibit small thorny bosses around the nose. They diverged along four lines, changing the character of their teeth, total mass of body and browsing habits as four distinct styles of a biological movement. But all of them developed typical and almost identical horns out of these bosses in parallel fashion. Slight thickenings at the sides of the nose became the elevations and modifications of tissue which enlarged into definite horns. Through thirty-million years of evolution these horns of the titanotheres proliferated according to the same general pattern, as if they were all following an underlying creative impulse at the same time.

A parallelism of stylization in landscape and portrait painting emerges among the Flemish, the Italians, the Spanish, the French and the English schools during the Renaissance. Even the laws of fashion and variations in the modes of behavior we call manners illustrate the same principles. Throughout, the primacy of the psychic is apparent in the subtle interplay of imagination and possibility, drive and realization. The stresses of predominant psychic impulses have regulated the flow of creative energy in technology and art among human beings in a manner similar to evolution of organ function and tissue variation among plants and animals. The end result of their effects shows how auto-selection decides the production, survival or elimination of the material by-products of their activities.

The evolutionary history of the horse exemplifies the workings of the principle of auto-selection in another step-by-step series. It is the most detailed instance available of successive transformations of structure under the influence of continuing modifications of function, directed and accentuated by the pressures of necessity and the satisfaction of success. As is true of few other animals, an unbroken chain of fossil remains of the ancestors of the modern horse provide the material for this interpretation of the various known transitions between the first representatives of the species and their latest.

As the earth became covered with juicy grasses, palatable and digestible, many new vertebrates appeared, herbivorous animals that lived by browsing upon the rich vegetation. These well-fed vegetarians, among which was the first horse, fructified and multiplied, and in turn, stimulated the emergence of predatory carnivora, like the large sabertoothed cats, tigerlike beasts, adapted to feed upon the others. The struggle for survival between the vegetarians and the carnivora forced the herbivorous animals to cultivate an instinct of flight and a great speed of movement to outspurt those who would prey upon

them. To escape their carnivorous enemies, therefore, the vegetarians took to running swiftly upon the tips of their toes. And many modifications of their body structure took place in consequence.

The original ancestor of our horse, *eohippus*, was a small graceful creature about the size of a cat, with the teeth of a pig, with four toes on his forefeet and three on his hind feet and vestiges of two others. Concentrating his urge for survival in his legs and feet for ages, he gradually transformed himself into *mesohippus*, an intermediate breed with three toes on each foot, the middle ones the largest. Running on the toes, the ankles were kept well raised above the ground and became hock joints. At the same time the head, neck and body became bigger and lithier, eyes, ears and smell more acute, in correlation with the progress of the lower extremities. The middle toes grew longer and stronger to support the larger animal, much heavier than its ancestor. Out of this intermediate stage there finally arrived its latest descendant, the modern horse, moving each leg on a huge single toe, but carrying remnants of the two side toes in the splints, slender, useless bones buried in the skin. During the time that these steps in the metamorphosis of the feet and legs were traversed, the teeth also changed. The rending canines were finally omitted and grass-chewing molars for grinding and chewing were substituted.

Similar considerations apply to the development of camels and dromedaries. The evolution of the horse out of its very different predecessors is a classic instance of the transformation of species by the environment, supreme evidence of the fact of organic evolution and natural selection. And there can be no question that changes of climate and environment, of feeding habits and character of terrain, all played their part directly in stimulating certain adaptations through the hereditary germ plasm. But due credit must also be given to the accompanying psychic selection of that which was to be accentuated and therefore nourished and a rejection of that which was not serviceable. The roots of its workings must be sought in the secrets of the psychic manipulations of flesh and blood, of the action of fear and anxiety, of relief and satisfaction, of the straining of every nerve to escape the clutch of death, or concentrating the energy of hunger.

The modern horse may therefore be envisaged as having made his hoof out of the continuous pressure of the urgency of his ancestors' desire to survive, out of their protoplasmic libido as it flowed into the evolution of their feet. The evolutionary history of the horse is better known than that of most other types of existing animals. Who can doubt, who can deny here, the influence of psychic effort,

the action of the sense of need, the hypertrophy of that which is subjected to emotional pressure, the atrophy of that to which it is indifferent? Who can fail to see the whole as a significant illustration of how the combined effects of conscious and unconscious psychation in response to the demands and contents of a changing environment have influenced the course of evolution?

There is no better example extant of how psychic auto-selection of organ function, inevitably bound to recur with every episode of flight, determines lines of development when it has operated with sufficient frequency over a long period of time. For we know that every movement of muscle and tendon, joint and bone, carries its own characteristic sensation from the sense organs situated within them, the proprioceptors, to the brain, where they are unconsciously perceived. It must be postulated that the emotion accompanying the sensation of running on tiptoes brings a feeling of efficient motion and effective escape. That must have brought about an ultimate registration of that feeling of satisfaction in the chemical representatives of the feet first in the continuities of the brain, and then in the continuities of the germ plasm. That emotion of fear, that desire for escape, that need for co-ordination was what brought about the harmonious correlation of these anatomical adaptations in the extremities of the horse with those in its skeleton as a whole.

The translation of the creative psychic feeling into physiological modification, so subtly transmitted by the molecules of the genes and chromosomes, is a problem for the scientific student of genetics who will concern himself with the psychic metamorphoses of tissues and organs. Nevertheless, an attempt, may be made to understand them in terms of present-day knowledge of emotions and bodily changes.

Feeling, the anguish of the moment, stimulates outpouring into the blood or lymph of various chemical secretions such as those of the adrenal and thyroid and pituitary glands. Thence these are transported and concentrated automatically in the tissues most functionally active, diluted in those least active at the moment, in accordance with the law of metabolic gradients, as found to be true in the healing of wounds and fractures. That is, tissues with the highest metabolic needs demand and receive more of their requirements from the blood than those of a lower metabolism with lesser nutritional demands. Either suddenly or after agelong subjection to their bombardment, some chemical reverberation of these differences may affect the chromosomes of the local cells, which are exactly the same constitutionally as the chromosomes of the reproductive cells. By some chemical

mechanism not at present understood, these latter finally resonate to what occurred in the former and are themselves correspondingly changed. So at last the psychochemical transformation of the species will be achieved in accordance with the primary psychic needs and efforts of the individual.

A million years were traversed between the fears and hopes of eohippus and his modern derivatives. It took all that time for the profound secular transformations to be accomplished which overcame the inertia of the genes and chromosomes. The slowness of the changes involved is additional evidence of the importance of the psychic life of a living organism for its history and development and the significance of internal emotion and function as well as external substance and conditions in the modification of species. These moving pictures of the making of the horse, so carefully and completely elaborated by the paleontologist, are indeed most valuable illustrations of the action of psychic forces in the history of life. As they are exhibited by biologists as the most convincing testimony of the truth of their teachings regarding the origin of living species from those no longer in existence, they are also the most convincing indicators of psychophysical correlation and dependence in evolution which can be submitted to an unprejudiced interpreter of their meaning.

13. EVOLUTIONARY ENERGY OF THE PSYCHERGIA

Every bit of concrete information regarding the correlation of animal psychation: of kinetic behavior, functional adaptation and anatomical expression in evolution, provides valuable clues and leads for scrutiny of the underlying psychic stream that flows through the protoplasmic substance of the life-personality. Without being grossly or crudely anthropomorphic, one may compare these evolutionary manifestations with those admittedly psycho-saturated demonstrations of the power of the protoplasmic libido presented in the productions of human art and techniques. Such an interpretation of them does not necessarily deprive them of the validity or verifiability of the scientific method, nor does there have to be anything mystic or esoteric in the rational testing of their truth.

The critical methods of scientific study are as applicable to the psychic as to the physical and chemical processes of protoplasm. In due time it may be possible to arrange the experimental conditions by which the principle of psychic auto-selection in an animal may manifest its power to decide the turn of a mutation and the line of evolution of its kind. It is a challenge to the ingenuity of the scien-

tific investigator who is unprejudiced and conscientiously considerate of every possibility. But it will never be carried out without giving due place to the influence of time, and the effect of repetition, over a sufficiently great number of generations, of the effect of the psychic situation. The importance of time has been granted and emphasized for natural selection, why not equally for auto-selection?

In the study of the living and their mechanisms, again and again is presented the spectacle of an anticipated organization of tissue for a use or function in which it is to be employed much later. Such anticipative organization, like directive organization, implies prevision of the end to be attained by its construction. If that cannot be accepted as evidence of psychation then all meaning is erased from the word. For the scene is staged before the play.

Barcroft has called attention to this anticipative phenomenon in the embryo. He has described it as the "tendency for something to be formed, not at the time when it is required, but definitely in advance of that time." This law of anticipative organization illustrates the other side of psychation in the embryo, the side directed toward the future, just as the law of recapitulation illustrates the side turned toward the past. One of the most interesting and striking of these anticipative structures is the ductus arteriosus, or arterial duct.

Every individual developed and born out of the womb of its mother (viviparous) is, in its prenatal phase, without independent respiration or digestion, and completely dependent for its supply of oxygen and nutrients upon the maternal circulation. The point of contact between embryo and parent is a specially formed organ within the womb, the placenta, which normally is expelled as the afterbirth. The embryo, suspended within a sac of fluid, is tethered to the mother by a cord, the umbilical cord, by which it is firmly attached to the placenta. Within the umbilical cord run an artery and a vein, which provide, by a process of diffusion from the placental blood vessels, the necessary chemicals of the blood for the growth and differentiation of the being to be born. As the fetus receives aerated blood from its mother through the umbilical vessels, it is not necessary for it to use the mechanism of circulation in its lungs.

Arterial blood flowing from the placenta becomes mixed, as it enters the body of the embryo, with the embryo's own venous blood, returning from the trunk and lower extremities by way of the great vein, the vena cava, which empties into the right auricle of its heart. There it would also become mixed with the venous blood returning from the head and upper extremities were it not for a special arrange-

ment, worked out to reduce this extremely undesirable mixture of the fresh blood and the used blood. The arrangement consists of a device for shunting the blood from the lungs through the *ductus arteriosus* into the general circulation. After birth, blood passes from the heart to the lungs by way of the pulmonary artery. By means of the *ductus arteriosus*, a small canal which branches off from the pulmonary artery near the heart and leads to the descending aorta, the blood from the right ventricle, which will later go to the lungs, is diverted and kept pure for the rest of the body.

With the birth of the individual into the new world of atmospheric oxygen, the *ductus arteriosus* becomes unnecessary, as the course of the circulation now becomes totally changed because of the active participation of the lungs in blood aeration. As soon as the lungs inflate with the first breath and cry, a considerable amount of blood is transferred from the pulmonary artery into the newly functioning lungs. With every succeeding breath, more and more of the blood is thus diverted, and a complete separation of the arterial blood from the venous is thereby ultimately achieved. But for this to happen, the *ductus arteriosus* must be completely closed off, so that no shunting of the circulation through its vent can occur. To shut it off, a muscle has been developed within the walls of the *ductus arteriosus*. By its contraction a clamp is applied to that channel, and no more blood can flow through it. That muscle exists only for the few moments that it must function immediately after birth. It comes into being long before that event and apparently just waits for the moment, the stimulus of which is probably some physicochemical change in the blood that accompanies the natal crisis. Nevertheless, it is an undeniable fact that its existence and its structure represent an anticipation of what it is to do and accomplish for the sake of the organism as a whole. Having fulfilled its function, it, together with the entire *ductus arteriosus*, shrinks and atrophies until both are finally completely obliterated. The history of the *ductus arteriosus* is an example par excellence of the principle that throughout the living organism the right structures appear at the right moments and at the right places to carry out the right effects for the good of the whole individual.

Anticipation, selection, direction—as well as memory, awareness, and self-regulation—these are the criteria of psycho-activity, and where they are found, it is found. If when they are present in a given situation or system, the effects of psychation are not admitted or postulated, then all meaning is taken out of the word, the reality of con-

sconsciousness itself must be negated, and a crass nonpsychism or anti-psychism which parades under the name of materialism must be allowed its dogmatic absurdities. Nor are there any self-sterilizing or stultifying consequences in that conclusion for the pursuit of the scientific method in its search for the relations of cause and effect in the systematic placement of the data of experience. Only there will have to be permitted within the realm of its working concepts that of the psychergia, the specific energy of the psychic life.

An example of the principle of auto-selection is provided by the work of Richter, Young and others on the ability of animals to select the foods best fitted for their needs. Their experiments demonstrated that the most deep-seated chemical requirements of the body were reflected in a desire for the specific foods that would satisfy those requirements, a psychic condition of excitement for, selection of, and satiation by, particular substances for which a physiological hunger in the tissues existed. By an ingenious placement of receptacles around their cages, rats were offered the opportunity of taking as much as they wanted of foods differing in their content of proteins, fats, carbohydrates, minerals and vitamins. The animals picked out exactly what they physiologically needed for their best growth and health and indeed more effectively than any diet that could be contrived for them by human specialists in rat nutrition. Moreover, sick rats selected for themselves foods that were corrective for their illness. Those with diabetes avoided sugar, those with adrenal-gland deficiency took extra salt which helps to keep them alive, and those with defective pituitary glands took just the right amount of water for their metabolism. The adrenal glands control the salt chemistry of the body, while the post-pituitary regulates the water chemistry. Similar findings occurred as regards different vitamins.

We can be sure that the rat does not know what a vitamin is or where his glands are. But changes in his glands or vitamin chemistry reflect themselves in his psychation, which in turn influences his behavior and is transmuted into changes in his tissues. Certain sensations of satisfaction are provided by the right foods which have a certain taste. When the animals lost their sense of taste as the result of an operation on the gustatory nerve, they could no longer discriminate between the meanings of the different foods for their states of health or disease. The animal, however, responds even more subtly to his body requirements than the mere sense of taste would indicate. The substance saccharin has a sweet taste but it provides no calories of heat equivalent as does sugar. On those days when the rats took

saccharin they compensated for the lack of real sugar by taking the caloric equivalent from other foods. But on the days they were permitted the sugar, they reduced their intake of other foods. When they were given alcohol, they would take only a certain quantity of actual alcohol, no matter how strong or weak the drink was, and in addition they consumed less of the regular foods in exact proportion to the caloric equivalent of the alcohol ingested. Thus the closest correlation has been demonstrated between the psycho-activity of an animal and its most fundamental needs. The organic effects of such psycho-activity, therefore, must be admitted to be capable of reaching, when intense enough, into the deepest recesses and most intimate reactions of the tissues and cells of each creature.

Investigations of the functioning and behavior of plants, animals and human beings all point to a psychic participation in their origins, persistence and modifications. The amoeba is the best known of one-celled creatures living in water or moist places where there is some organic matter to feed upon. Studying them for evidence of selective sensitivity and the capacity to be modified favorably by experience, which might be called the direct criteria of psychation, Jennings, pioneer student of their behavior, wrote as follows:

First, we find that in organisms consisting of but a single cell, and having no nervous system, the behavior is regulated by all the different classes of conditions which regulate the behavior of higher animals. In other words, unicellular organisms react to all classes of stimuli to which higher animals react. All classes of stimuli which may affect the nervous system or sense organs may likewise affect protoplasm without these organs. Even the naked protoplasm *Amoeba* responds to all classes of stimuli to which any animal responds. The nervous system and sense organs are therefore not necessary for the reception of any particular classes of stimulations. . .

The reaction to any given stimulus is modified by the past experience of the animal, and the modifications are regulatory, not haphazard, in character. The phenomena are thus similar to those shown in the "learning" of higher organisms, save that the modifications depend upon less complex relations and last a shorter time. . .

Objective investigation is as favorable to the view of the general distribution of consciousness throughout animals as it could well be. So far as objective evidence goes there is no difference in kind, but a complete continuity between the behavior of lower and of higher organisms. We start at one end with our own doings, in some of which intelligence counts, we pass gradually, though never perhaps by rigid demonstrations, through the behavior of our fellows, our horses and dogs, birds and fishes, spiders and hermit-crabs, ganglionless starfishes and sea-anemones, to the extraor-

dinarily puzzling condensed individualities of Infusorians and Amoebae. Nor will it be easy to shut out carnivorous plants and others that stir themselves in what seem to us a sleep-life, whose dreams are flowers. At all levels of organization we find behavior which, objectively considered, is like our intelligent behavior.

Fish and birds and mammals and primates all present in their ways of manipulating the environment evidence of the same psychic forces at work. The glimmer of intelligence that flashes in the self-regulation of the earliest organisms gradually becomes brighter, more intense and more lasting as areas for the preservation of memories and their old and new associations—brains—are evolved. As that evolution proceeds, the really amazing tendency and capacity to form habits becomes more and more marked. Even a very feeble kind of psychation could conceivably build up in the course of ages the remarkable and complicated fabric of constructions and behaviors that are so characteristic of the varieties of living systems. Slowly and painfully initiated and elaborated, the relegation of the psycho-activity involved to the domain of unconscious memory would account for the fixed, the overt intelligence displayed and its relatively diminutive amount.

The constructive efforts and effects, visible behind all the activities and manifestations of the life-personality, are continuous throughout the series of organisms which constitute the stepladder of its ascent from the protista to the primates. These, in turn, are continuous with the creative productions of art, science, and technology identified with the highest constructions of human civilization. We understand the mechanism, the teleo-mechanism, of one as little or as much as that of the other. But there is no reason for saying that neither we nor evolution can ever or shall ever penetrate the secrets of the operation of these teleo-mechanisms and auto-selections. The life-personality must operate with the logic and laws of its materials: that is evident. That is why it has taken so long—a billion years perhaps—for it to arrive at the present stage of consciousness. But throughout the long, long story its moving finger may be discerned as the determinant of the plot and the working out of the story.

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THE CREATIVE POWERS OF THE UNCONSCIOUS

1. THE LINK BETWEEN THE PSYCHIC AND THE PHYSICAL

As the long, slow history of the life-personality reveals a varied spectacle of new and different individuals and species, there is evidence throughout of a continuity of psychic participation in its creative efforts. The creations of life bear much more of a resemblance to human inventions and to the achievements of art and science, all traceable to the operation of psychation, than to the mechanical patterns by which crystals arise out of their matrix liquors or the stars known as the novae out of cataclysms in the heavens. The alikeness of the human and subhuman psychophysical productions is suggested, indeed demonstrated, by many facts and analogies. There is an attention to the composition of the whole, an adaptation of the ways and means to organic ends that bespeak a binding together of past, present and future—a correlation of recollection of previous experience, sensitivity to the immediate, and an expectation of things to come. And these are the accepted tests of psychation in any observable process or event.

Furthermore, it is now known that there is much more to psychation than consciousness, and its operations include more than its wakeful activities. For contemporaneously with the spread of the doctrine of evolution promulgated by Charles Darwin a certain contradiction to its implications has been engendered: a perception of the unity of all the manifestations of life as the co-ordinated parts of a metamorphosing but immortal life-personality, and a remarkable series of discoveries regarding the continuity, extent and depth of its psychic nature. These discoveries have indeed turned out to be potent antidotes to the virus of arbitrary accidentalism inherent in the sheer mechanical-materialism of the Darwinian thesis. As a matter of fact they have turned out to be complementary in their significance to

the biological facts he had brought into the foreground of science.

These discoveries center around the fundamental principle that psychic action or psychic work—psychation in its broadest sense—may function, in fact function predominantly, in living beings, without consciousness, that is, without being equipped with that direct focal awareness of the immediately perceived to which the word “conscious” is ordinarily applied. A great new universe of reality has been unveiled, a new world even as yet only partially and fractionally explored, the world of the unconscious. This is the world where the physical meets the psychic, where the reciprocal transformations of their energies are effected, and the knots of their union are tied and woven and sustained. These two great perceptions—evolution and unconscious psychation—have matured simultaneously in the human mind and have become part of the imperishable heritage of the human race.

Their flowering has already affected immeasurably the whole course and consequence of human intellectual history. The idea of an eternal growth and change, complication and differentiation of protoplasm, the idea of its material evolution, has become balanced by the idea of the concomitant identity and continuity of its psychation maintained through the eons of time. The unity and integrity of the unconscious psychoplasm has been preserved side by side with the multiplexities of the metabolic protoplasm. An unceasing activity in conservation as well as in creation of the psychic movements and work of life-personality has constantly been involved with the deepest and most essential events of its physical and chemical mutations and differentiations. Metabolism and psychation together have been working the miracles of the evolution of protoplasm in the intimate molecular-atomic vastnesses of its cellular transactions. Language may, must, separate them, in its analyses and emphases. But in actuality they are as inseparable as the inside and outside of a glove.

As the scientific scrutiny of their products and processes has progressed, it has become apparent that matter-in-mind or mind-in-matter can be dissociated only abstractly, only in the domains of psycho-reality where ideas operate, but not in the interfused complexities and articulations of objective reality. The mystery of one is the mystery of the other. And there is as much mystery about matter as there is about mind. The unity of all matter is now admitted, and the unity of mind-matter or matter-mind must also be admitted. No understanding of evolution is possible without the inclusion of a participating psychation in its history. And no understanding of the history of any personality, individuality or organism on its psychic

side is possible without a knowledge of the material metamorphoses undergone by the living protoplasm with which it is associated.

The establishment of this distinction between psychation and consciousness was a great achievement from many points of view. It constitutes an achievement as subtle and bold as that which substituted evolutionism for creationism in the classification of species. Especially must it be applauded because it overcame a prejudice of common sense and common logic. It seems obvious, simply as a matter of everyday language and definition, that the psychic and the conscious are synonymous, that the conscious is always the mentally experienced and that, interchanging the terms of the proposition, the mentally or psychically experienced is always conscious. But the cumulative observations of the importance of psychic effects in both normal and abnormal life have convinced observers that the assumption that the conscious is the only form of the mentally experienced is not always true, that they are not always one and the same, and that in fact the conscious is only a small part of the total psycho-activity of any individual.

2. TRANSITIONS BETWEEN THE UNCONSCIOUS AND THE CONSCIOUS

Between the sensitive skin of any living creature and its rigid bony framework, between the quivering flesh and the flashing energy of brain and nerves, spreads a network of psychic influence which binds together the organism. And these psychic effects may or may not be associated with consciousness. A number of facts and experiments have compelled that conclusion from all unbiased reasoners. It is now known that there are certain curious relationships between the body and its psychation which can be understood only in terms of unconscious operations, partaking of the nature of the psychic but not connected with any immediate and direct perceptions.

Consciousness, in the sense of that upon which the spotlight of awareness is focused, is not a prerequisite accompaniment of psychation. Consciousness, meaning the condition of being alert or awake, may be defined as that property of psychation which appears when there is forced upon it immediate consideration of the environment, internal or external, and its significance for the living individual as a whole. Consciousness is only a special quality of psychation attending the reception of news from its milieu either within or without itself. It is a red heat of the organism's psycho-activity as it is warmed by its reception of fresh or novel or meaningful fuel. To put it in another way: consciousness is a function of protoplasm by means

of which the significance and values of reality as a whole are tested and established. It must be present for the effective integration of any living system with the environment. But otherwise, it is not an essential quality of psychation. In the absence of such stimulation, such titillation from its outer or inner surroundings, it lapses almost automatically.

Much of our knowledge of unconscious psycho-activity—the unconscious—in the normal has come from intensive study of its peculiar manifestations in the abnormal. The curious and fascinating effects of its disturbances, the excessive excitations and inhibitions of psychation in the neurotic and the possessed who approach the borderland of insanity, provided the entry of science into the mysteries of its dynamics. It was found that there is no fixed boundary between the normal and the abnormal, that there are all sorts of transitions between them, and that one shades imperceptibly into the other without any sharply defined distinction. All physiological and pathological manifestations of the psychic life are one and continuous, and their differences are only those of degree.

Among these facts are the abnormal conditions classifiable as the illusions and hallucinations, obsessions and delusions, the daydreaming and reveries of the psychopathic. Some of them can be reproduced experimentally by the administration of such substances as alcohol, and hashish, morphine and cocaine. The insane, the neurotics, the neurasthenics and psychasthenics, all have contributed to the elucidation of the trail of the unconscious. But it was above all the investigation of the night life of psychation, its behavior in sleep and dreams as well as in the pseudo-sleep of the hypnotic trance that yielded proof of unconscious psychation. Following clues that gradually became linked through the mazes of the varieties of abnormal animal and human behavior, research has demonstrated a fundamental unity of psychation underlying the most diverse unconscious occurrences.

3. EVIDENCE FROM HYPNOTISM AND POSSESSION

Under the influence of unconscious psychation there appear inexplicable and irrational impulses to behave in a bizarre manner in typical situations, or in impulsive utterances of speech apparently unrelated to and without significance for the ordinary consciousness. Certain compulsions of feeling or thinking emerge continuously to plague and mystify their possessor. He does not feel himself their possessor but rather their possessed, he acts as though he were being moved by a will other than his own. These eruptions into the organ-

ized and apparently self-directing personality are most alarming and disconcerting to consciousness. They may bring in their train important consequences for the total life history and disturbances of adaptations with which physicians, psychologists and sociologists must deal. Whether they affect individuals or groups, they have all opened the doors to a new understanding of the powers and dynamics of psychation.

From the beginning of recorded observation there has been an ambivalence of attitude toward these appearances of possession. The possessed, including the insane, were regarded as abnormal, but sometimes as supernormal and at other times as subnormal. Often they were revered as holy vehicles of sacred messages and were regarded as possessed of a clairvoyance and wizardry denied to ordinary mortals. But they were also treated as black magicians and witches inhabited and directed by devils and incubi, and therefore, as worse than criminals, to be tortured and executed. Thousands of the possessed were burned at the stake in the medieval centuries and numberless others imprisoned as the most dangerous representatives of Satan on earth. It was only with the age of reason, the great period of liberal enlightenment of the eighteenth century, that demoniac or insane possession was classifiable with ailments of the body. Then a more humane attitude and special institutions were provided for the victims. It was in this same age of rational tolerance that Frederick Anton Mesmer introduced the concept of "animal magnetism" or "mesmerism" that was ultimately to yield the scientific technique of hypnosis by which these phenomena have been deeply penetrated and fruitfully explained.

There is thus a direct genealogical line between the semi-charlatan Mesmer and modern psychology of the unconscious. The scientific hypnotism of Braid led, through Bernheim and Charcot, who thoroughly exploited its therapeutic possibilities, to Freud and Jung. And after them dozens of investigators employed its technique as a key to unconscious psychation in dreams, and to a dynamic understanding of those strange disorders of personality and behavior which appear as the symptoms of neurotics and psychotics. During the second half of the nineteenth century, hypnotism gradually lost the aura of charlatanism and theatricalism in which it was born and which had surrounded it for a hundred years. The hypnotic method of psychic study and control of the individual, normal and abnormal became firmly established as a definite scientific procedure. Its phenomena have contributed weightily to a comprehension of the

nature and dynamics of the unconscious. Through it the concept of psychation without consciousness has become susceptible to objective testing such as can be applied to any scientific hypothesis. Indeed, no more convincing test could be devised than what occurs in the hypnotized, both during the trance and afterward.

Hypnotism makes accessible certain powers and areas of the unconscious that can be reached in no other way. Among the most convincing experiments are those conducted in posthypnotic suggestion. In the hypnotic state the individual acts as if he were making no distinction between a thing or process and the idea of the thing or process. The mere utterance of the name of a thing or the insertion of the idea of an action makes it at once real and immediate. Certain ideas can be implanted at this time by the hypnotist. In the posthypnotic state, when the individual has been awakened and restored to his usual consciousness, with no awareness of what he has been told to do or why, minutes, hours or days later, the idea acts in the unconscious with a permanent capacity to enforce its will. Its effects seem analogous to all those other automatisms which appear in psychic disorders of personality and behavior.

When one sees how a human being, under the posthypnotic spell, long after he has been restored to his normal consciousness, carries out the hypnotist's suggestion and, moreover, acts as if he had originated the whole notion spontaneously, one cannot but admit the existence and power of unconscious psychation. For example, the suggestion may have been that he open the windows of his room on a cold winter night, at about one hour and a half after being awakened from his hypnotic sleep. During the intervening hour and a half he may maintain an animated conversation, or he may eat or read, or do nothing, absorbed in his own thoughts. Then, as if compelled by some dynamic force, he becomes uneasy and distrait. Even if he is engaged in some absorbing activity at the moment, he will interrupt and suggest that the windows be opened. Or he may say that the room has become intolerably hot or stuffy, and open the windows himself. But he will always improvise some plausible reason for his irrational act; that is, he will invariably rationalize his hypnotic automatism. Yet it is obvious to all who have witnessed the hypnotic seance that the suggestion of the task to be performed, inserted into his unconscious by the hypnotizer, has caused him to act like a robot.

As has been previously mentioned, a hypnotized subject may carry out such suggestions days, weeks and even months later, though without any remembrance or awareness of their influence during

all that time. For with the loss of critical resistance to implanted impressions during the trance, there is also a loss of power to recall what happened. Yet on being restored once again to the hypnotic state, a perfect memory of all previous occurrences can be demonstrated. Not only that, but memories of experiences which have long since disappeared from the range of conscious recall may be revived.

In addition, several distinct personalities may be built up in the same individual by different hypnotizers, all of which personalities may live together, side by side, unaware of one another's existence. These singular but significant posthypnotic phenomena taken together constitute the most convincing demonstration of the reality of the powers of unconscious psychation. Several such streams of psychation may trickle or flow furiously but separately in the same individual organism-personality, all finally to empty in that sea of his psychic being, the unconscious. These splittings and coexistences of consciousness and psychation constitute the most valuable of leads to an understanding of disturbances of the unconscious in psychopathic cases.

4. THE UNCONSCIOUS IN DREAMS

Adding its contribution to these revelations of the hypnotic method are the conclusions of its child—the psycho-analytic method—derived fundamentally from a study of the meaning of dreams and dream states of the unconscious psychic life of human beings. It is almost but not quite as convincing, and certainly much less objective. Its discoveries have been quite as significant regarding those two-sided aspects of psychation: the conscious and the unconscious. Beginning with an analysis of the dreams of the psychically ill, it has proved that the details of the night life of every individual psychation, however healthy and normal the dream that unfolds in darkness, can be understood only in terms of the dynamic effects of unconscious psychation. In dreams the unconscious seems to be directly experienced by the self which is the fusion of body and mind. But only seemingly, for the unconscious, too, is modified in the transformations of its energy by the necessities and compulsions of the laws of psycho-reality.

The physico-reality, the external world, comes to consciousness only after a filtration through the sense organs and the molding patterns of time, space and logic. The unconscious presents itself to the dreamer only after it too has undergone editing and transmutation by the psychic organs of pain and pleasure, the registers of the permissible and the unpermissible. The content of a dream then stands in much the same relation to the absolute truth of the unconscious as a

perception of objective fact does to the absolute ultimates of the universe. In either case, the assurance of contact with the basically real is provided by the same standards: the permanence, the internal consistency and coherence of facts as they present themselves to the objective observer.

The unconscious is indeed the very core of psycho-reality. But it is also the bridge of the psychophysical continuum. For not only is it susceptible to the psychic dynamics of suggestion, of the intimations of words or pictures, sights or sounds, or smells. It is also the medium of deeply seated psychophysical events: of those interactions of mind and body intimately involved with changes in the great basal ganglia.

In the buried masses of gray matter where reside the centers of metabolism, instinct and emotion, in the deepest layers of the ancient brain, with its direct connections to the great sympathetic nervous system that spreads its tentacles throughout the organism-personality, those subtle transmutations of mind into matter and matter into mind—to use the old words—appear to take place. There, in the depths of the old brain, overlayed by the larger enveloping lobes of the new brain which functions in conscious adaptations, the unconscious performs its organic wonders. There mutations in the blood, variations of metabolism, chemical reactions of food with protoplasmic substances and energy, seem to be transformed into unconscious psychation, and unconscious psychation into an alchemy of cells, tissues and organs.

Any one of the organs not under the influence of consciousness, such as the heart or the stomach, the bowels and the bladder, may be rendered abnormal in function by a disturbance in the unconscious. Such disturbances may be relieved or cured by obtaining access to the unconscious through hypnotic suggestion. Similar disturbances can be traced to abnormalities in these same basal ganglia and their associated involuntary nerves, the part of the nervous system normally not under the control of the individual or accessible to his consciousness. They can be controlled by drugs or hormones acting upon the autonomic basal centers. The interchangeability of nonconscious chemical effects and unconscious psychic effects in this region of the brain has been demonstrated.

Such constants of the body as temperature, blood pressure, and the hydrochloric acid of the stomach, have been changed by hypnotic manipulations of the unconscious. Even the healing of wounds and burns has been effected. In one experiment burns of the same size and position were produced on the arms of two individuals. It was

suggested to them under hypnosis that one should heal more quickly and with less reaction than the other, and that was how the healing actually proceeded. All these facts sustain the thesis of the constancy and universality of the influence of the unconscious upon the body and its processes. There can be no question of its access to the physical and chemical, material and functional patterns that mean so much to the individual and yet are utterly out of reach of his conscious will or wakeful deliberation.

The unconscious of psychation never sleeps and never rests. It is perpetually involved and concerned with the life of the cells, tissues and organs, at their deepest levels. Because it is a reservoir for all experience, pleasurable, indifferent or painful, advantageous or disadvantageous, it may be said never to forget, which is another way of saying that it never ceases to exist, never abolishes itself. Consciousness forgets that which has no interest for it by a mechanism of suppression. Consciousness forgets also, by the process known as "repression," that which has for it too much of a painful interest. Both suppression and repression are registered by a transfer of energy to the basal regions of the unconscious.

Even the degree of attention consciousness confers upon an experience is regulated by the unconscious, which directs its interests and value. The influence of the unconscious upon the contents of consciousness and the results in behavior of this influence cannot be disputed. An accumulation of energy of the suppressed and repressed in the unconscious sooner or later must produce an expression in behavior, through splits and cracks in the resistance, or veritable explosions which catapult themselves into consciousness if their pressures are not permitted normal channels of escape.

5. PSYCHERGIA AS A SPECIFIC ENERGY

Such upheavals prove that there is an intensity factor as well as a quantity factor in psychic energy comparable to the voltage and amperage of electricity or the calories and temperature of heat. This energy of the unconscious, of nonconscious psychation as well as of conscious psychation, seems to be released by the metabolic transformations of protoplasm. Moreover, there exist various modes of this psychic energy depending on its associations with special organs and their characteristic substances and functions. Psychosexual energy, for example, is related to the pituitary and sex glands, psycho-aggressive energy, to the adrenals and thyroid. The chemistry of the various endocrine glands in their relation to the blood and brain must

therefore be considered together in any analysis of the transformations of their energy into activators and instigators for the unconscious.

Psycho-energy or psychergia, when observed empirically like other energies, is characterized by its selectiveness and directiveness, its capacity to give persistent direction and self-regulating form to otherwise inchoate matter and energies. That is its qualitative definition. It may be patterned metrically along axes of quantity and intensity like other energies. The general law may be stated that as regards its distribution into conscious and unconscious, the conscious is characterized by intensity, the unconscious by quantity. Whenever the psychic energy involved in a situation or urge reaches a certain intensity, consciousness appears, either smoothly or as a burst, whereas the quantity of psychic energy in specific instances of unconscious activity may attain very large proportions, relatively, and yet function quietly and efficiently in the dynamics of the living organism. Whether an instrumental measurement of the quantity and intensity effects of the psychergia in the unconscious will ever be achieved probably depends upon the discovery of ways and means of defining units of these two variables.

These conceptions co-ordinate rationally the nonpsychic energies and the psychic. They render more comprehensible as well the outstanding harmonies of body-mind, normal and supernormal, pathological and quasi-pathological, that the pursuit of hypnotism and dreams has revealed. Therefore from this point of view the unconscious cannot be regarded simply as a name for a miscellaneous collection of abnormal phenomena of psychic life. Nor can it be explained away as only that which is inhibited from becoming conscious. Nor can its operations be looked upon as essentially morbid and appearing only when there is conflict and distress like that of the neurotic in his dreams or the somnambulist in his nocturnal adventures, or the manifestations of the hypnotized, the hysterical and the psychotic.

6. SOURCE OF CREATIVE POWERS

The unconscious has played a vital role in those renunciations and redirections of the instinctive activities of human beings which have made possible their co-operation in the conquest of the earth. Without its inhibitions and controls human beings would have slaughtered one another long ago. The unconscious has restrained the ego's impulses toward aggression and destruction which could only arouse counter-aggression and answering destruction. But that role of the unconscious

is comparatively negative, comparatively destructive, when contrasted with the constructive and creative outcome of its functionings. Much of the astounding architectonics on the positive side of the history of mankind, the prodigious remaking of the environment as well as the enormous additions to it of materials and forms that could never have been begotten of it spontaneously, the molding and the building of thoughts and stuffs, the realization of potentialities, the crystallization of latent possibilities and values attained through the generations of humanity, must be credited to its creative beneficence.

Even in the most grotesque and bizarre dreams, the unconscious displays in its mimics of reality the essentially constructive nature of its activities and a purposeful unity of effect. All the elements of art work are present in the dream work. Symbolization and stylization are discernible in both, and the free movement of analogy and association. The substitution of the part for the whole and the whole for the part and the formulization of design which enable a whole series of images to pass as counters for one another are evident both in primitive art and neurotic dreams. They are present even in more sophisticated intellectual art. The condensations and distillations of images and patterns in dreams find their homologues in the efforts of abstractionism and of the art which consciously imitates the dream: surrealism. The painters and composers, the poets and, less obviously, the sculptors and the architects, present such striking resemblances to the unconscious makers of dreams because the underlying drives and needs of creation are precisely the same in all of them; all originate in the unconscious, in the psycho-activity which needs must drive on to order and superorder.

The unconscious is omnivorous for experience. A perpetual flow of sensations and perceptions, thoughts and emotions feeds its insatiable appetite. Yet it is not merely a storehouse for them, a limbo for what consciousness has no immediate use. For it acts as a net for the individual's experiences, but it is not to be swamped by the plethora of its catch. It is not just a collector of events, but also their classifier and assimilator, a creator of order out of the chaotic flux of the sensations. An economy pervades its dynamics, an economics of both reception and expression. Even its inhibitions normally make for a saving of energy and favor the lines of least resistance and maximum advantage. The rules of efficiency in the unconscious conform to the laws of energy economics. Its storage system includes the countless configurations of experience that evolve new patterns of organic expression. Incorporating them by an ever-growing creative process,

its energy works perpetually toward new forms that vary all the way from new thoughts to new organs and new machines.

Childbearing and artistic creation have been found to be mutually exclusive, which indicates that the quantity of creative energy in any one individual is limited. The unconscious is at work in the creation of art, the creation of a child, the creation of organs and tissues, but it is quantitatively limited. The transformations and end products of its directive energy in different areas and for different purposes are most varied. Throughout it is always regulated by the laws governing all the manifestations of energy.

Too much attention has been paid to the performances of the unconscious in the disturbed and ill, not enough to its influence in the normal and healthy. Biographical data concerning the role of the imagination and invention in science, philosophy and metaphysics—realms of psychation in which the rational consciousness seemingly rules—also point to the unconscious as the true locus of creation. Conscious thinking has undoubtedly contributed a certain proportion of energy and direction to the creative achievements of science, philosophy and metaphysics. But by far the larger portion of their most brilliant achievements derives from this same territory of unconscious psychation. These contributions of the unconscious to creative activities have passed under the names of intuition, or inspiration. Such operations resemble in every respect the participation of the unconscious in the artist's fantasies and the dynamics of dreams.

Consciousness contributes to the creative situation, first of all, a sense of need. It leaves a feeling of suspension after an exhaustive breakdown of a problem and a catalogue of possible solutions. But the missing links, the lacking ideas, the necessary new conceptions come to be supplied by the unconscious in a manner which cannot be mistaken for the designs of conscious effort. Men say that they have worked as in a dream or that they have dreamed and lo and behold! either in a flash of association or after a long incubation, the pieces of the puzzle have arranged themselves. Or certain necessary missing parts have suddenly appeared and completed the pattern. The important complements or supplements to the conscious work have emerged, and originality and novelty, in short, creation, became evident. There has been a parturition from the unconscious.

In studying these constructive gestations and births of the unconscious there becomes apparent a curious similarity of psychic creation to the history of alimentary metabolism, the adventures, fate and destiny of food in the body. After the ingestion of food there occurs

digestion, a breaking up of the food particles into much smaller, assimilable ones. This is much like the dissociative activity of the unconscious by which it dissects an experience into elementary, reassociable parts. Before new association there must be dissociation. Absorption into the blood follows digestion and that resembles the agglutinations of the dissociated parts in the unconscious. These agglutinations seem to depend upon conditions of likeness and fitness which by a conjunction of parts passes into true assimilation. A configuration of associables settles into more or less stable systems which tend to enlarge and amalgamate continuously. All these effects, of dissociation and reassociation, of disintegration and reintegration, terminate finally in a growth which represents a new psychic creation, resembling newly grown or reproduced matter.

Ideas in the unconscious combine and separate. Out of the nidus of association arises a new creature accepted by conscious psychation as a gift from the gods. A germ of conception, after a suitable period of incubation, emerges into consciousness as an evolved novelty where it is welcomed as an unexpected but much desired companion of other thoughts, bearing that which saves them from starvation or malnutrition. These functions of the unconscious will some day be completely correlated with the chemical reactions of the metabolism of the brain and indeed the total organism. There is conclusive evidence of some indissoluble bond between them. Knowledge of the mutations of the one will contribute to knowledge of the mutations of the other, perhaps to knowledge of the mutations of species and the course of evolution.

7. SIMILARITIES OF PHYSICAL AND PSYCHIC INCUBATION

Psychopathology has naturally stressed the repressive and destructive, the disease-producing and morbid powers of the unconscious. Recognition of its dominant role in evolutionary and human creation returns the emphasis to where it belongs: to its constructive, life-widening and life-ramifying activities. The basic needs of protoplasm for order, for conservation and co-ordination of that which is useful and valuable for life, and for the disintegration and excretion of that which is noxious and harmful, is the foundation of all the physiological as well as the psychological functions of the unconscious in an organism.

One of the characteristics of this creative order-producing power of the unconscious is that of *incubation*. Its psycho-activity requires the passage of a period during which the solution of a problem or the completion of a pattern remain latent. During this time a feeling

of need concerning them rests in a state of suspended animation. Consciousness may not concern itself intensively with the matter, but in the unconscious there is never any cessation of activity. Every element that might fit into the uncompleted pattern, every association that might belong to the nidus of the directing idea, is given its chance. It is like a dance of swinging partners, swirling from one group to another, to bring together those who belong together.

The incubatory phase of any configurative creation is a period of trial and error for the unconscious thinking out of a question, the coming to some conclusion, the organization of the query and the final rendering of the answer. Embryonic incubation is well known. By a series of arrangements and rearrangements, shifting and transformations of the original egg materials, the chick is turned out designed for the life of its species. The concept of incubation originated as a name for a process taking place under cover. It was extended to that of disease incubation because of the fact that an infection like that of scarlet fever or measles remains latent after the entry of its virus, to break out, after a definite interval of time, as a manifest and disturbing illness. Allergic incubation, like that of hay fever or food sensitiveness, also implies the identical notion of a pathology developing and then emerging like a chrysalis out of its cocoon.

Ideas, hypotheses and theories, inventions and discoveries in the world of psycho-reality, also incubate in the unconscious in a manner analogous to the emergence of the embryo, or of infection or allergy. Underneath the surface waters of consciousness, in the depths of the unconscious, these conjunctions and fertilizations of images and fragments of images occur. The parturition of a new idea from the unconscious into the conscious is like the movement of a creature from the womb into the world. It is the offspring of a union of previously existing psychic elements. The incubatory necessity presents a remarkable similarity between an intellectual production and the physiological elaboration of the embryo and the pathological outbreak of a disease. It points strongly again to the identity of the actual ways and means, the mechanics and dynamics of the reactions by which the unconscious can influence all the organs of the body in their transformations and mutations during the evolution of the life-personality. However, the emergence of an idea from the unconscious into the conscious is not accompanied by that dissolution of the umbilical connection between offspring and matrix which attends the birth of a child or the cure of an illness. Even when exposed under

the brightest lights of consciousness it retains its connection with its source.

8. THE UNCONSCIOUS, INVENTIVE GENIUS OF EVOLUTION

Numerous specific occurrences recorded in the history of science, art and technology testify to the reality of these powers of the unconscious as the creative force in ideation and invention, poetry and discovery. These are psychic productions motivated by a feeling of need, interest or desire—all the aspects of the cravings of the libido underlying protoplasm. And the end products of such creations, the human manipulations of materials, changes of behavior, realization of plastic possibilities, remind one constantly of the way in which tissues and organs of the body are modified by the psychergia working in the unconscious laboratories of cells, chromosomes and genes, which leads to those differentiations of tissues, organs, individuals and species that mark the upward movement of the life-personality.

The origins of the variations and mutations of individuals which have constituted the evolution of species are in every way comparable to the genesis of new ideas and models of things. The unconscious is the psychophysical crucible of both. In the lower animals and in plants its influence is diffused throughout the creature. In the higher the seat of its double activity is centered in the interbrain, or old brain, which is the representative of the most primitive organizing centers of protoplasm. In the one case its creative energy flows to the cortical gray matter above it, the organ of ideation, while in the other it flows to the tissues below it, where it transmutes and transforms them and in time affects their chemical equivalents in the reproductive cells, the genes in the chromosomes.

It would appear that the general law operating throughout all creation is the same: that an experience in consciousness becomes associated with an emotion of desire or frustration leaving a feeling of dissatisfaction. Such an experience produces an effect in protoplasm like an uncompleted figure or an unbalanced structure. Consciousness then seeks to complete or balance the image with its resources, to supply what is lacking. It fails, gives up for the time being, but relegates the situation, in a state of supercharged tension, to the unconscious. There, various other residues of past experience join with it, testing the possibilities of completion, as in the trial and error method of solving a problem. The achievement of a satisfactory conclusion is registered by an eruption into consciousness of the solution, accompanied by a feeling of satisfaction or elation. During the time of

incubation some combinations of elements may come into consciousness and crystallize as partial solutions. An unfolding of incomplete solutions of possible patterns may thus present a series of variations, with transitions from one to the other, or there may be a sudden solution corresponding to a mutation. All these are again analogous to the phenomena of evolution as they have been biologically observed.

Gutenberg recorded in his letters the succession of psychological events which led to his invention of printing. They illustrate perfectly the laws of progressive incubatory variation, with the final culmination of the inventive, primarily psychic, impulse in its ultimate material achievement. The letters tell the story of the creative adventures of his unconscious. First he was possessed of a passionate desire for a universal circulation of the Bible. He was obsessed with the length of time and the amount of labor consumed in the hand copying of manuscripts and with the need for the duplication of books by some speedier method. An image of the pictorial character of the lettering of manuscripts, haunted his unconscious, seeking for mates.

In this quest he was impressed by the way in which inked woodcuts of playing cards and portraits of saints were engraved upon paper. He thought of the metal image punches used in the manufacture of coins. Then he took part in a grape harvest and observed the working of the wine press. It occurred to him that lead seal-like letterings applied to paper or vellum under something like a wine press would serve the purpose. Lead suggested itself because it was the one metal which would leave a mark when pressed upon paper. So he set to work and completed his invention, writing: "I have had a large quantity of lead brought to my house and that is with what I shall write . . . one must strike, cast, make a form like the seal of your community, a mould, such as that used for casting your pewter cups, letters in relief like those on your coins and the punch for producing them like your foot when it multiplies in print. There is the Bible."

A mathematical genius, the Frenchman Henri Poincaré, has recorded in his self-observations how his own psychation worked in the making of his idea inventions.

For a fortnight I had been trying to prove that no function could exist analogous to what I have since called the fuchsian function. I was very ignorant at that time. Every day I sat down at my table: I passed an hour or two there; I tried a great number of combinations, but I did not reach any result. One evening I drank some black coffee, which I was not accustomed to do. I could not sleep: ideas crowded in on me; they

seemed to me to collide with one another, until two of them hooked together, as it were, to form a stable combination. In the morning I had established the existence of one class of fuchsian functions that derived from the hyper-geometric series; I had nothing to do but to check the result, which took me a few hours. . . .

At this time I left Caen, where I was living at the time, to take part in a course of geology. The journey made me forget my mathematical work. When we arrived at Contances we got into an omnibus to make some excursion or other. At the moment of putting my foot on the step, the idea occurred to me, without anything in my immediately preceding thoughts having prepared me for it, that the transformations which I have used to define fuchsian functions were identical with those of non-Euclidian geometry. I did not verify this. I had no time to do so, since no sooner was I seated in the omnibus than I took up the conversation I had begun; but I was entirely certain of the result. On returning to Caen I verified it at leisure, in order to satisfy my conscience.

I then set to work to study arithmetical questions without any apparent result of importance, and without suspecting that there would be the least connection with my previous researches. Disgusted with my failure, I went for a few days' holiday to the seaside and thought of quite other matters. One day, while walking on the cliffs, the idea occurred to me, again with the same characteristics of brevity, suddenness and certitude (I underline these words) that arithmetical transformations of indefinite ternary quadratic form were identical with those of non-Euclidian geometry. Here was a new problem. At first all my efforts only served to teach me the difficulty more fully. This part of the work was entirely conscious. It was again followed by unconscious work. . . .

This was followed by my departure for Mont-Valerien where I had to perform my military service. I thus had very different preoccupations. One day, whilst crossing the street, the solution of the difficulty which had stopped me appeared to me quite suddenly. I did not attempt to go into it more deeply at once, and it was only after my service that I took the question up again. I was in possession of all the elements, and only needed to assemble and arrange them.

What will strike you at first are these appearances of sudden illumination which are the manifest tokens of a long unconscious labour which has preceded them; the part played by this unconscious labour in mathematical invention appears incontestable to me, and traces will be found of it in other cases where it is less evident. Often, when one is working at a difficult question, one produces nothing of any use on the first occasion of attacking the problem; later, one may take a rest of greater or less duration, and sit down at the table again. For the first half hour one may continue to get no results, and then quite suddenly the decisive idea is presented to the mind. One could say that conscious labour had been more fruitful because it had been interrupted and because the rest had

restored to the mind its power and freshness. It is more probable that the period of rest is filled by unconscious labour, and that the result of this labour is afterwards revealed quite suddenly to the geometer, as in the cases that I have cited; only that the revelation, instead of appearing during a walk or a journey, has been produced during a period of conscious work, but independently of this work, which plays at the most the part of a releasing force, acting as a stimulus which excites the results already attained during the rest period, but still buried in the unconscious, to take a conscious form.

And Paul Ehrlich, when he was pioneering in the study of the formation of antibodies by the blood against bacterial toxins has described how his side-chain theory came to him one evening as he was riding home on a bus:

I fell into a reverie. Atoms flitted before my eyes. I had always seen them in movement, these little beings, but I had never before succeeded in perceiving the manner of movement. But that evening I saw that two smaller atoms coupled, that larger ones seized the smaller coupled ones, that still larger ones fastened onto three or even four of the smaller, and that all whirled around in a bewildering dance. I saw how the larger atoms formed a row and one dragged along still smaller ones at the end of the chain. The cry of the guard, "Clapham Road," waked me from my reverie; but I spent a part of the night writing down sketches of these dream pictures. Thus arose the structural theory.

The attitude of reverie, possessing certain similarities to the state of sleep or hypnotism, renders the activities and products of unconscious gestation more accessible to consciousness. But even without these, the solution of a problem, once achieved in the unconscious, will force its way into the personal awareness or behavior of the individual. This law has been incontestably established. Inventions and discoveries of human psychation erupt like sudden mutations, an abrupt emergence of radical departures from what has been the norm or near the norm for the species. They flash out of the unconscious. Many cases of such eruptions of full-fledged conceptions, solutions intellectual and mechanical for long-latent problems of the artist and technologist, are on record. Many individuals have narrated such experiences in the solutions of their private problems. Appetite, desire, craving, obsession, long-continued and persistent interest, both conscious and unconscious, have been at the bottom of the discoveries and inventions of which the history is known. All along the line there is evidence of continuity of the psychic participation in the whole. It selects and differentiates, assimilating that which is useful and rejecting that which is useless.

How does the psychic energy, the psychergia, involved in such effects achieve these changes? The answers to these questions will come through many researches that must be carried out regarding the relations of the great centers of unconscious psychation in the ancient under-brain to the neighboring centers of metabolism as well as to the regulators of all the physiological functions, the endocrine glands, which maintain the momentum of creative imagination. Furthermore, there must be solved the problems of the mechanisms by which such psychophysical and psycho-chemical modifications of organs and tissues can be transmitted to the genes and the chromosomes, protoplasmic materials of heredity. There is no inherent reason for denying the effects of long-continued bombardment or an intense shock of psychic energy upon them, while accepting as proven the power of radioactive energy or cosmic rays to affect them.

It is reasonable to believe that the reproductive cells are constantly accessible to the influences of the unconscious through the body fluids, the blood and lymph, and the hormones and other chemical substances they carry—and the energy of the impulses transmitted by way of the autonomic nervous system. What has to be experimentally proven is that the sufficiently deep-seated and prolonged changes produced by the unconscious in the nonreproductive tissues finally register and represent their transformations in the reproductive cells. Such experiments will undoubtedly be properly contrived at some time in the future and their results can be predicted.

Only upon the assumption of the existence of such undiscovered mechanisms of psychophysical and psycho-chemical transformations of energy by the unconscious can a host of the phenomena of evolution be explained. Only thus can be correlated numerous observations concerning the behavior and structure of the living systems which stand out in such contrast to the characteristics of inorganic nonliving machines; such as the employment of old parts for new uses. Old organs fitted to new functions—these are analogous to the making over of old inventions, or parts of old inventions, into new ones in the progress of human arts and technologies.

The body of a fish, for instance, incarnates the solution of the problems of a creature that must maintain itself in water. It is streamlined from its headlights—nose and eyes—to its propeller tail. Its fins are perfect lateral oars, its gills are adequate water filters for washing in oxygen for its breathing and washing out its waste carbon dioxide. It has a balloon swim bladder with which to vary its weight in the water, as it needs to rise or descend. When the fish took to the land be-

cause conditions forced it to do so or because it became interested in the mud land, it had to make itself over. Thus it adapted the swim bladder into organs for aerating the blood, and made lungs out of them. As the water-breathing gills became useless they atrophied.

Another example occurs in the lowliest fishlike ancestor of the land vertebrates, the lamprey. The heart of the lamprey is a thickening, an area of increased muscularity, of a long arterial tube, which simply assists in squeezing blood along its direct course from behind, forward. Among the true fish this has been improved into a two-chamber affair with valves, which, however, still continues to pump the blood along one direction. But again, when the fish becomes the land animal, this is readapted into a four-chambered heart to handle a forked circulation, one of the red oxygenated blood forward, and one of the blue deoxygenated blood backward. So new parts are reconstructed out of old materials, and new wine poured into old bottles continually in the evolution of animals and plants, as well as in the history of human inventions and discoveries.

The later creations of evolution which have turned out to be important in the development of more highly evolved species have centered around new applications of old structures. In man, because of his adoption of the upright position, there is not a bone, or a ligament, or a muscle or an organ that has not undergone such readaptation and reconditioning. They remind one irresistibly of the different steps of adaptation of previously existing instruments and ideas in the productions of art and science. The psychic qualities of selection, direction, and reconstruction of ancient materials for fresh usages are manifest throughout. And it is in the magic caldron of the unconscious that we must look for such manipulations of substance and energy.

In readaptations certain absurdities sometimes result and residues of old uses persist. These vestiges constitute homage to the conservatism of the protoplasmic imagination. The early designers of airplanes copied the construction of birds even to the imitation of wings. When the first automobiles were modeled, they were built like carriages, even mimicking the coachman's seat for the chauffeur. Literally, they were horseless carriages, with an internal combustion machine or a steam engine attached. Only gradually, and part by part, were the various components of the carriage replaced by substitutes specifically suited for the functions of the new instrument, as for example the substitution of rubber tires for the old hard wheels. Even a machine like the airplane has only recently freed itself from the drag of old

associations, and the necessity of modeling the new upon the chassis of the old.

Living bodies are full of similar oddities and the crudities of simple parallelisms. Three mammals, man, whale, and bat, have all evolved from an ancestor who was possessed of five phalanxed fore limbs. The whale swims with its flippers, so it was long taken for a fish. The bat flies with its wings, so it was long taken for a bird. And man manipulated his hands so subtly and effectively that he has been taken for a fallen angel. But whale flipper and bat wings are simply the bones of the same hands foreshortened and rearranged and covered and connected by muscle and skin.

The unconscious is the inventive genius of evolution. Its productions range from the beautiful glass houses of the protozoa to the sublime mathematical abstractions and philosophical speculations of the human mind. All the stages of transition in its creations may be traced, from the purely physiological to the purely psychological. Organic adaptations arise and persist in accordance with laws strikingly similar to those governing the appearance of human contrivances. At no point can a precise dividing line, a boundary of specific qualitative difference, be drawn between them.

The records of the electrical pulsations accompanying activity of the brain, which have been called the brain waves, indicate that the chemical changes of psychation take place even during sleep, during the dominance of the unconscious. They may represent psycho-electrical transmutations of energy. They suggest the lines along which further development of knowledge of the actual dynamics of these productive functions of the unconscious will probably proceed. But that the psychergia is there and is preponderatingly influential in determining organic patternings, development and evolution by its auto-selective, auto-directive, auto-organizational properties, characteristic of psychic energy, cannot be denied and must be included in any truly scientific explanation of them.

Charles Darwin was struck by the similarities between the human selection of domesticated varieties of animals and plants and environmental selection in the world of nature. Such creations of the human unconscious as science, art and technology are true analogues of the physiological changes of function and structure by which the transformations of species have been produced. In the struggle for existence between animals and species the capacity for such physiological invention, or the lack of such capacity, has determined survival. In the rivalries of ideas and their mechanizations we see but

the counterparts of the survival of the fittest. A great difference in the speed of the process of adaptation has been introduced in human affairs by the discovery of language. Language has made possible much speedier conjunctions and disjunctions in the depths of the unconscious. But otherwise the inventions of the human brain and the adaptations of protoplasm have much in common: unconscious psychation is at the bottom of both.

While words have served to expedite the transformation of ideas into materials and those intercommunications of human beings which enable one generation to build upon the shoulders of the preceding as no other animal ever has, they have also worked to interrupt that continuity of the unconscious in the anatomy and physiology of his being which is so evident in the animal. That is why man's desires and objectives can no longer express themselves in mutations of his flesh and blood, his body structure and organ function except perhaps of the brain itself. The energy of the psychergia is consumed in the productions which take form in books, works of art, and technical achievements.

Wordless consciousness and unconscious psychation have much in common, as can be observed in the movements of a dynamic dancer, a violin virtuoso or a master aviator. Man has paid a tremendous price for the advantages of language. Not the least of this price is the loss of intuitive understanding of how his own psychergia operates in his moment-to-moment life as well as in his evolution as a species. It is a loss which must be recovered.

9. ORDER AND PSYCHO-ACTIVITY

New methods and new forms of adaptation engendered in the imaginative unconscious are the creative expressions of its underlying principle of order, which is also the great principle of conservation behind unconscious memory. Whether the conservative or the creative powers will predominate in any particular individual depends upon the stability or instability, the equilibrium or the lack of equilibrium of the organism as a whole in the face of changing conditions within itself or without. A multiplicity of ingenious structural and functional inventions have been generated in organisms by the productive powers of their psychation. A certain number of these have become fixated as the inborn anatomical, physiological and behavior patterns of species. Among them are the instincts, which possess the inertia of a basically conservative tradition that resists change and often destroys itself because of its resistance.

The variations and mutations which lead to the evolution of species originate, like invention and discovery, in states of instability and consequent disorder, in a disturbance of the traditional organization, a dissatisfaction that may verge upon the psychopathic and that is akin to the instability of genius. A biological sport which founds a new line of species development may be regarded as a stroke of genius on the part of the unconscious. Its broodings and brewings have been the forces at work at the bottom of the variegated creative urges and impulses that have incarnated themselves in all the amazing deviations as well as the beautiful regularities and exquisite orderliness of the forms of life as they have appeared on the planet.

Every nest-making bird, every geometrical honeycomb, every swarming anthill and every delicate spider's web displays the feeling for order of psycho-activity in its various life forms. Their productions really constitute the intermediates of the continuous series which extends from the tiny radiolarian shell to the gigantic architectonics of the pyramids. The establishment of the blood and ancestral relationships of things living and the biologic pedigrees of things dead cannot suffice as an explanation of their order without taking into consideration the genealogy of their psychic handiwork, nor without giving the lineage of the creations of the unconscious, in all living things both great and small.

The concept of evolutionary descent is based upon a certain order in time and space of the structural resemblances between that which is, and that which was, with what preceded it, a hierarchy of forms. But these affinities of animals and plants cannot be limited within the bounds of form and structure only. For when we see creation by incubation and transformation in the works of man we must admit their similarities to and analogies with the subhuman creation of animals and plants. Comparative anatomy concerns itself with particular instances of similitude in the make-up of different creatures, comparative physiology with their likenesses in function. Comparative psychology reveals an identity in the forces at work in the entire sphere of life.

No laboratory imitations of vital activities can abolish the role of the unconscious in biological evolution. Even if it should turn out that the common material denominator of all order in protoplasmic differentiation is traceable to the chemistry of specific organizing materials such as the organizers of Spemann, linking heredity, memory and mutation with learning and invention, the same principles would apply. The organizer is still only the artisan-carrier of the psychic

energy, sculpting the successive models of embryonic development, or the old patterns of memory or the new patterns of mutation, or shaping the habits of learning, or manipulating the novel order of an invention. Strange miracles of control of all these varieties of form-making will come from human hands when these organizing materials become practically available. But until it becomes possible to control the psychergia as it functions in the unconscious there will be, there can be, no artificial creation of living matter as it manifests itself spontaneously in all its marvelous forms. Nor should the occurrence of these chemical organizers be surprising, praiseworthy as is their demonstration and fascinating as are their feats of morphological manipulation. Their fitness for their organizing work has not been the outcome of chance nor can their properties and functioning be considered as anything but another example of the impossibility of any complete explanation of protoplasm in crude mathematical terms of atomic concussions. For their very existence within protoplasms simply points to their being the most elementary inventions for the genesis of order by the unconscious.

A psychic interpretation of the order of life seems directly contradicted by current scientific beliefs and attitudes. Attempts to derive the universe out of a primeval chaos, with the earth as a child of that chaos and life as an accident on the earth, are the dominant intellectual dogmas of our time. The dictum of Huxley concerning consciousness as an epiphenomenon, a useless by-product of these accidents begotten of chaos, has had its sequel in the development of mechanistic and behavioristic teachings which would explain the evolution of life on the basis of a complicated physicochemical robotism. Vague mysticisms, irrational dogmatisms, and ancient animisms in the study of the manifestations of life have been properly displaced by the careful, detailed physical and chemical, physiological and biological studies of modern science which led the way to the doctrine of evolution. The negation—indeed the annihilation—of psychic forces in that history has been the unfortunate accompaniment of that scientific movement.

The problem of organization is the prime problem of the living. The problem of maintaining organization is the problem of keeping alive. The only energy known to be organizing in its tendency and essence is the psychic energy of the unconscious, the psychergia. A great many facts have turned up in the course of the study of animals and plants which prove that natural selection and chance variations by themselves cannot explain satisfactorily the evolution of forms.

The organizing principle of evolution is fundamentally the creative psychation of the evolving life forms. The organizing functions of the unconscious remind any unbiased observer irresistibly of the principles of order as observable in the workings of the human unconscious. This principle of order and organization is present and active within the core of every apparently isolated individual as within the heart of life itself. An integration and correlation, a continuity and indeed identity ties together life and the individual. For they are both involved together in all the physical, chemical and psychic manifestations which make a succession of orders visible from amoeba to man.

6

FROM THE UNCONSCIOUS TO THE SUPERCONSCIOUS

EVERY HUMAN PERSONALITY, ANIMAL OR PLANT ORGANISM, IS THE vehicle of a psycho-activity involving different degrees of participation of consciousness and the unconscious. Levels in the intensity of wakeful awareness range from the faint perceptions of a fern or sponge to the brilliance of a genius. And correspondingly there is a variation in the amount of unconscious psychation, increasing with every ascent in the evolutionary series, depending upon the accumulation of past experience. Together they constitute a double stream flowing as long as its carrier survives.

The life-personality, of which the individual or organism is but a passing part, must also be characterized by both conscious and unconscious psychation. To distinguish the characteristics of its psychation from that of its constituent individuals, its divisions may be differentiated as the collective conscious and the collective unconscious. Or they might better be designated the collective superconscious and unconscious.

1. FREE VS. CONTROLLED PSYCHATION

To term them the collective superconscious seems to convey better the intended meaning of an all-inclusive psychation, embracing and interweaving the separate psychic lives of all the units of the life-personality. It includes the consciousness as well as the unconscious of all the living as well as the memories of the dead. It implies an organic whole greater than any of its parts because it associates and incorporates them all in its own being. There is evidence—concrete, detailed, empirical evidence—of the objective reality of such a universal network of psycho-activity. As the background of the intercommunications of the psychic lives of past, present and future individuals the functioning of a mechanism of collective psychation must necessarily be assumed.

Certain techniques of dream analysis have contributed much to the substantiation of the concept of a personal psychic unconscious. They have proven the existence of a continuous and integrated but unconscious psycho-activity in every individual enduring as long as the metabolism of the particular brain endures. Using the fragments of this unconscious which appear in dreams and hypnotic states, the range of conscious memory has been extended and revived until in some cases it has reached even to the moment, experience and shock of birth. In the excavation of these buried and tangled unconscious memories and the unraveling of their significance, certain laws of association have been shown to hold throughout their presentations as the connectors and agglutinators by which they cohere. Deeply hidden experiences, thoughts and emotions, reposing in the lowest layers of the unconscious, have been uncovered through the linkages of these laws of association.

The varied psychic experiences of the past, judgments, impulses and volitions, have thus been discovered to be bound together in constellations and configurations, complexes of associations, that may be reproduced together out of the continuum of the unconscious. The placing and timing of memories in these complexes follow laws that may be accepted as indicating the forces that determine psychic associations. Records of experiences in the unconscious are laid down in dynamic associative patterns. The territory of association in the unconscious is much longer, wider and broader than that of conscious learning and recollection, for the network of memory extends deep into the past. When consciousness is unshackled from restraint or criticism, these patterns will re-emerge, like writing in invisible ink when subjected to the right reagent.

Such group formations of memory comprise, in effect, the nuclei or foci of survival of significant episodes and experiences of the life history in the unconscious. Special periods and interests in the individual's life become stratified in relation to the successive gradients of time in his biography. The memories of early childhood are thus segregated from those of adolescence; the recollections of juvenile experiences are layered beneath those of more mature existence. A block of memories may be juttred out of their stratifications into consciousness by the effect of an odor or a scene, a phrase overheard or a face suddenly seen in the street. Or they may be deliberately restored to conscious memory by finding the correct key in dream or fantasy, by which the door to their bonds of linkage can be unlocked.

These unconscious chains of association in latent memories are

responsible for the individual's sense of his own identity and continuity, as cases of amnesia have demonstrated. They operate not only for patterns of memory, but also in those correlations of functions known as conditionings, which are basically physiological associations. It is by keeping in constant touch with his unconscious, to its remotest beginnings, that the individual knows himself to be one and the same person from infancy to old age.

In reaching for sets of memories which have a bearing upon morbid complexes in the unconscious connected with neurotic and abnormal behavior, the technique of dream analysis has uncovered remnants of the individual's past history long considered buried beyond recovery. These have been revived and have emerged into the analytical consciousness under the influence of uncontrolled or free association. Free association has turned out to be directed by the unconscious, as contrasted with controlled association which is generally regulated by the conscious. In free association, the connections of the elements associated are not determined by their logical or rational values for the individual, as in ordinary conscious thought. Rather are they seen to be dominated by the deepest urges and impulses of the unconscious. They represent the most meaningful residue of the oldest happenings in the life history, those which once possessed a special significance for primeval psychation. And they have been responsible for the creative and constructive as well as the destructive work of the libido.

2. LINKAGES OF INDIVIDUAL PSYCHO-ACTIVITY

In the world of psycho-reality the laws of association are really representations of the ways new experiences are organized into the personal unconscious. They tell how assimilation of new experience into the previously existing unconscious gives it *meaning for the future*. An experience is said to have meaning when it is immediately or spontaneously organizable or assimilable by the unconscious. The unconscious behaves toward it as an organism behaves toward food, as something that can be consumed or absorbed. An experience lacks meaning when it is not thus assimilable, organizable or digestible.

Such assimilation and organization are essential to the living dynamics of protoplasm and psychoplasm. They underlie both metabolism and memory. So it should not be surprising that the same laws apply to both physiological and psychic association. The facts and laws of association are identical and indistinguishable for body and mind. Psycho-reality and physico-reality are thus once again seen

to be merely aspects, the inside and outside of the same underlying reality.

Nothing within any living system is permitted to remain apart or isolated either physiologically or psychically. An unco-ordinated series of separable factors—foods, energies, movements, reactions, perceptions, recollections—is fashioned into a co-ordinated whole by patterns of connections which are really miniature organisms within their larger combining organisms, organoids within organs. Thereby is preserved the integrity of the forms and functions of the complex internal structures of the organism that fuse into the total personality. Organization of the lesser fragments into the more inclusive patterns regulates the lower and higher psychic activities, the play of emotions and instincts, all abstract ideations, the course of imagination, as well as cell growth, and reproduction. The same laws of organization apply throughout the body-mind of an individual.

A law of associative synthesis operates at the bottom of all the manifestations of life. It is a process indissolubly linked with the ordering activity of its directive psychic energy or psychergia. The laws of such association are essentially portraits of how the essences of experiences that have been poured into the crucible of protoplasm are incorporated into the unconscious. The incessant fluxes and tides of psychation are thus canalized into the cycles of metabolism, producing the unity of body-mind. Concomitant is the sense of an integrated individuality, and the sense of self-identity and separation from other bodies and minds.

Conscious perception and action are imperative for man because he must incessantly adapt himself to a varying environment. After every such adaptation there remains a residue of recordings, the kernels of unconscious memories, which are relegated to the unconscious. These unconscious representations or complexes of experience bear a certain resemblance to the fixations of ancestral substance, the genes and chromosomes, for the history of the species. As the way in which the genes and chromosomes are linked is decisive for the form and function of the species, just so the associational linkages of the unconscious are the building stones of the individual personality.

Because the human psyche is thus constituted of revivable constellated associations, a reconstruction of past and present becomes possible for the analyst. Many parts of it become accessible to the probing of him who can find the clue. He may discover that path by means of a word, a flash of memory, of perception or revelation which act as intermediary associants. Many hidden patterns and many experi-

ences of the unconscious have thus been uncovered by use of the linkages of the past and the present. But these have pertained only to the past personal life.

3. INTERPRETATION OF COLLECTIVE IMAGES

Analysis of associations has revealed the content of the underlying psychic life of the individual, conscious and unconscious. But extension of their methods has also disclosed that they are equally applicable to the associations of a collective unconscious and superconscious, one actually superindividual in its scope. For they have proven fruitfully employable in the interpretation of certain supernormal psychations, properly designated as supernormal because they are by no means common or regularly recurring as are the avowedly normal phenomena. Indeed, they may be said to contradict and negate the so-called normal, since they cannot readily be fitted into the scheme of consistencies which constitute the everyday psycho-realities of individuals and form the accepted background of the common objective physico-reality.

To explain these, it may be postulated that certain of the contents of the personal unconscious, as they are repeated from one generation to the next, come to be preserved in the genes and chromosomes. Traced back to their original ancestors, they are the exemplars par excellence of the intimate association of psychation and protoplasm in the very germ cells of the individual. Such most ancient elements of the unconscious psyche, the enchained residues of primeval images repeated in the lives of countless ancestors, are revived whenever the latent memories carried by the germ cells into the brain of an individual are kindled into revival by some experience of the present.

Again, these latent ancestral images may also emerge into consciousness through the deliberate employment of the laws of association. By means of such associative techniques it has become possible to dredge the unconscious, to penetrate to its depths, and to crystallize out of it its most hidden contents. Besides, there are the methods of so-called intuitive psychic work which are concerned with the recognition, recall, or reconstruction of past experience by the use of imagery or verbalization revived by a half-free, half-controlled association.

Now, if the life-personality is a reality with a continuity dependent upon the chains of unconscious memories of countless generations, a collective unconscious psychation composed of these residues of individual experience must be assumed as inherent and active in its

total dynamics. Furthermore, if a collective psychation is functioning behind the continuity of the life-personality, its constitution must be so like that of the individual personal psychation that its contents and connections, too, follow the same laws of association. Consequently it should be possible, under suitable conditions, to tap such a collective unconscious by applying the methods of free association.

Findings from a certain group of observations would seem to indicate that such contacts with the collective unconscious have been established by a few exceptional individuals. When the personal unconscious is explored by the method of free association in the analysis of dreams, there comes a point when the analyst seems to be advancing into territory beyond the most primary experiences of the individual. The associations would then appear to be reviving ancestral images and ancestral experiences. Certain recurring and symbolic figures of the remotest past and oldest cultures of mankind emerge in these dream fantasies. These imply the possession and transmission of a familial, tribal, racial, superindividual unconscious. The individual's unconscious flows off into the ocean of all the personalities who have contributed their protoplasm to his making.

This bold idea of a collective unconscious as a prolongation of the personal unconscious has been elaborated by the students of the unconscious who have centered their work around the conceptions of Karl Jung. From dream analysis Jung and his students have collected associations that can be referred to the most primitive cultures, certain recurring mythological figures, religious practices and art images. These archetypes, representations of man's earliest abstractions, are personifications of complexes of experience and emotion and attitudes of behavior and adaptation which are completely foreign to the normal personality of the dreamer. Yet they were natural, and universal beliefs and habits of the early men, the first wordmakers and culture originators, who would appear to have made the first contributions to the unconscious of the human species.

4. PERSISTENCE OF PRIMITIVE PSYCHATION

Such traces and reminders of the psychic life of their primitive ancestors may be found in the unconscious of all men. Their latent presence in the bottommost layers of unconscious psychations can be proved by certain allusions present both in dreams and in behavior. Ancient images are still dominant in the lives of contemporaneous primitive peoples. They also exhibit themselves at certain stages in the development of the children of the civilized as well as in the

dreams and behavior of neurotics. Almost exclusively they are pictorial in character, because primitive and child are practically incapable of abstractions, which represent a different and later realm of psychic evolution. A difference in the chemistry as well as in the growth of the nervous system is probably behind this difference between primitive-child and mature culture.

The unconscious thinks and manifests itself in concrete picture symbols, because these constitute the common ground of the earliest memories of our species. The basic psychology of the first human beings was of an image-making character which served to fix its object more definitely and permanently in the brain and nerves. Savages and children are more prone to have such fixations because they are eidetics—image makers and image retainers—and their blood and cell chemistries physiologically facilitate the deposit of such concrete imagery. The art, the paintings and sculpture of children of primitives and of dreams are fundamentally identical. In their motifs and themes the dominant figures and symbols of the ancient psychic life of man recur throughout the world. That is why, though individuals may be extremely differentiated in the conscious contents of their psychation because of education, culture and personal idiosyncrasy, they are much alike in their unconscious psychology.

Typical complexes revealed in dreams show uniformity of meaning and imagery. These primordial images are derived from the subjects that occupied man's imagination tens of thousands of years ago. They are generalized because the earliest human beings possessed the least degree of individuation. Above these millennial remnants of mankind's common memories are deposited the learnings of the first group distinctions. There is also evidence of a collective unconscious that is actually more specifically, geographically and climatically, conditioned. There are even said to be archetypes or primordial images of prehuman origin exhibited in the psychation of both animals and human beings. As animals, too, have certain experiences over and over again, and as, inferentially, animals have dreams, the presence of such most ancient archetypes in them would show itself in the disposition to react with fairly well-defined movements and emotions to recurrent situations. They may come into play in the inherited patterns of behavior which involve the instincts.

In the case of human beings, these universally distributed primordial images, constituting the oldest contents of human psycho-reality, are those of the magical powers of psychic energy in all its marvelous transformations. The psychic energy or psychergia is regarded as being

at first ubiquitously diffused as mana, then split into images of demons and gods, of heroes and saviors, of animal totems and animal devils. And it is upon the foundations of these images that the oldest animistic religions of the world have been established. These figures of the collective unconscious are stamped into the psychation of the peoples of the earth in the most widely separated regions. Together with their dim, dark figures fuse the great images of nature, the sun and the moon, light and darkness, the masculine and feminine, good and evil. Mother images as the symbols of dependency stand side by side with the father images as the symbols of authority. Blood sacrifices as the images of guilt mingle with giants and monsters as the images of fear. When mathematical measurement first indicated its possibilities to the human unconscious, the images of balances and geometrical shapes appeared as representations of truth. Etymologically, the word, "mind" means to measure, and proclaims the kinship of words like the moon and menses and menstruation.

Sometimes in dreams there flashes from the world of unconscious fantasy or reverie a sudden scene or figure which has the effect of a haunting wistful strain conjured from far-off forgotten things. They are nostalgic remnants from man's remotest past, wafted by some trick of association through those narrowest of portals which ordinarily shut him away from any conscious contact with it. But they indicate that there are profoundly embedded in the unconscious immortal representations of the millennial experience of primitive life, an indelible record of the continuity of the protoplasm throughout its generations even in its psychic experiences. That recognition enables us to understand for instance why fullblood Negroes of Central Africa have evidenced in their dreams the images and ideas of the most ancient Chinese cultures on record.

5. ANCESTRAL PSYCHIC REINCARNATIONS

By simple calculations it can be shown that, even allowing for the intermarriage of relations, every adult alive within the time of Augustus Caesar, about two thousand years ago, that is, within the lifetime of Jesus Christ, could have been an ancestor to every human being now alive within the area that once comprised the Roman Empire. Going back another thousand years, every progenitor of offspring anywhere on earth at that time, who transmitted his blood, that is, his chromosomes and genes, to his immediate descendants, is an ancestor of every human being on the planet in our time. There is something of the protoplasmic substance of King Solomon, some

of the genes and chromosomal chemicals of Alexander of Macedonia and Darius of Persia, as well as of their lowliest soldiers and peasants, in every one of us.

When mythological and prehistorical figures of which the individual has no knowledge and indeed no point of conscious contact by education or learning appear in dreams it becomes necessary to consider their relation to this underlying blood relationship of all of mankind. Dream content of this kind suggests a reincarnation, according to the Jungian school of psychoanalysis, of the thoughts and images of a sufficiently remote ancestor. Such reproductions of mankind's most ancient imaginings present themselves only in the recurrent dreams of certain individuals. Only to a minority of morbid hypersensitives do there appear, in the nocturnal wanderings of their unconscious, these primordial figures, reminiscent of the myths which their ancestors believed.

These archetypes of humanity's first reactions to the realities of its environment, internal and external, are the heritages of all human beings. They constitute the original data of man's psycho-reality, handed down in a continuous line of descent. They represent an eternal demonstration of the immortality of ideas. A glimmering of these now and then emerges in the fantastical night roamings of all dreamers. In their nocturnal visions of ancestral conceptions of life and the world these dreamers revive the primitive psychation of their forebears. It is pervaded by the irrational fears and reverent submission to the incomprehensible forces of nature which appeared to dictate the answers to the questions raised by its hungers, hopes and desires. The archaic qualities of these dream images entitle them to be regarded as indicators of a psychic reincarnation, much in the same way that the recurrence of a certain shape of nose or form and color of eye may be taken as manifestations of a protoplasmic reincarnation of an ancestor.

Reincarnation of ancestral traits in the living body, a transmission of the physical characteristics of an ancestor to a descendant, is universally recognized. It has been scientifically verified and explained in accordance with the accepted doctrines of biology concerning the chromosomes and their genes as transmitters of heredity.

In the mechanism of heredity, the operation of which was worked out by Mendel and the students of genetics who followed him, the genes of the parents combine and recombine in the child, following the law of chance. It functions much as the fall of numbers in a cast of dice. An original throw—say six and a four—may be followed

in the next thirty throws by every possible combination, and then the six and four are thrown again. In an individual in whom exactly the kind of gene and chromosome configurations have been established that were present in the first throw, there will be restored all the characteristics of the ancestor who begot him thirty-two generations before. An actual, literally complete, physical reincarnation may then be said to have taken place. In the generations between, partial reincarnations emerge, as may be seen in the construction of the hands, or a gesture of the shoulders, or a lilt of the voice.

The psychic life of protoplasm is preserved in unconscious memory. The specific psychic qualities of species are reproduced in its generations in degrees that are as characteristic as the biological facsimiles of the original begetter. It is therefore possible that once in a great while there might also occur a psychic reincarnation, a veritable revival of the ancestral unconscious, so that the deepest and most frequently repeated experiences and memories of the ancestor might then express themselves in the recurring images of the unconscious of the reincarnated individuals. Such images could assume form and movement in dreams as well as in reveries, attitudes and behavior tendencies. Segments of such an ancestral unconscious might appear in every one of us much as bodily characteristics.

The images of the ancestral unconscious as they appear in dreams represent the present maximum of discovery, the limits of what conscious effort has obtained in its attack upon the barriers that separate the psychation of the generations. It has been attained by the application of the laws of free association to the symbolic language of dreams. But it might conceivably be possible to break down those barriers more effectively by extending the same techniques to physical objects that have associational potentials—the products of the preceding cultures which were familiar to the ancestral psyche—clothes, vessels, figurines, as well as landscapes and paintings.

If individuals who are, recognizably, definite reincarnations of previous epochs passed into a state of relaxed receptivity to such objects, flashes and later longer chains of memory might be resuscitated from their sleep in the crypts of the ancestral unconscious. How many connecting links between the personal unconscious and the ancestral unconscious might thus be traced remains to be seen. Those who have actually lived in an ancient generation might tell us much that is now unknown. A Frenchman, DeRoches, once carried out experiments in which he claimed to have revived such reincarnations in the hypnotic trance. Such psychic reincarnation of the images of the

ancestral unconscious presents many items of similarity to the revival and interpretation of the dream contents of the personal unconscious. A continuity of the collective unconscious, the ancestral unconscious, and the personal unconscious has been determined to be connected and connectible by the laws of organization that apply equally to the relations of matter, metabolism and memory throughout the adventures of the life-personality.

6. EVIDENCES OF SUPERNORMAL PSYCHO-ACTIVITY

Moreover, these same laws of association would appear to hold for the manifestations of a collective psychation which could be called the collective superconscious. A body of empirical observations has been accumulated which provides substantial support for the concept of a collectively distributed psychation with much more universal supernormal attributes than the ancestral unconscious. Sources of this evidence are various and possess different degrees of validity. They are sometimes described as the products of psychical research. Many academic practitioners of the scientific method regard this evidence as outside the pale of rational study and investigation. That attitude is not justified, in view of the number and importance of the phenomena involved and their implications for the most general concepts of matter and life, psychation and the universe.

For as long as human history, mankind has groped among these manifestations of a seemingly supernormal psychation, seeking for their meaning. Those who have accepted their reality have stood in awe of them as the inexplicable, the miraculous and the supernatural. Upon them and through them the priests and the practitioners of religion have established their creeds and rituals. Firmly rooted in the imagination of mankind are these extraordinary and mysterious phenomena.

It must be conceded that these forms of psychation are relatively abnormal and esoteric in that only a small minority of human beings possess them. And even they do not exhibit them regularly and upon demand, as other mental capacities—such as the mathematical, intellectual, artistic, aesthetic—can be commanded, although these, too, vary with fatigue and illness. There can be no question that they seem bizarre and elusive, and that they have been used as the basis of claims for the intervention of the supernatural in natural laws, to bolster superstition, and to belittle reason and science in favor of an irrational mysticism. Out of the mass of hallucinations, however, and trickeries there have emerged certain critically verified reports

of supernormal happenings, supernormal in that they appear to violate accepted criteria. As a result, a new territory of knowledge has been created. With the same open-minded critical approach and methods characteristic of such traditional fields of knowledge as physics, chemistry or biology, these phenomena of the supernormal have been studied, verified, even experimented with, like other natural phenomena.

The ascertained facts converge to demonstrate the reality of a truly collective psycho-activity including within itself the unconscious and conscious of all individuals. The observations entail the possession by certain individuals of verifiable kinds of information not acquired by means of normal perception—a phenomenon known under various names, most commonly as telepathy and clairvoyance. Precognition, which involves a verifiable knowledge of the future not predictable by strict logic or even by the laws of probability, is the name for another group of such phenomena. Still others present certain well-defined and extraordinary movements and behaviors of objects and human beings which seem to be achieved by extraordinary psychic forces. In clairvoyance and precognition, knowledge is manifested of occurrences and objects in space and time, of what has happened, or what will happen, remote from the here and now of the spectator or observer—knowledge that cannot be included in the scheme of common sense or the accepted principles of natural science.

In telepathy there is registered psychic rapport between two or more people without the necessity of speech, gesture or any recognized mode of communication in ordinary social intercourse. In clairvoyance, things and human beings are perceived in ways that cannot be explained by ordinary cause and effect. Human beings who manifest these phenomena are abnormal and exceptional creatures in the sense that the great majority of their fellow beings seem incapable of functioning as they do. This is true, at least of the civilized majority. Among primitive, so-called savage, peoples, the contrary may be true; the majority may be susceptible to supernormal influences.

In the Western world those who are specially gifted in these extraordinary psychiations are known as “mediums” or “psychics.” The word “medium” does not necessarily connote intercourse with the spirits or ghosts of animism, ancient or modern. Such mediums have been in existence during all recorded history, and, doubtless, from the beginnings of mankind. They have played a prominent part in the history of the Hindus and Hebrews, the Assyrians and Babylonians, the Greeks and the Romans. Julius Caesar and Cleopatra

employed soothsayers as members of their official retinues. Among the Egyptians they were supported by the state. Priests and prophets, oracles and magicians were recruited from their ranks.

Members of these hypersensitive groups seem to function best when they have been thrown or have thrown themselves into their own peculiar trance or trancelike state. The trance state is much like the induced hypnotic state, in which the range of consciousness is contracted in order to provide the fullest possible play for the manifestations of the unconscious. But they do not regard themselves as hypnotized. They look upon themselves as possessed, occupied, by an outside personality who is endowed with supernatural faculties.

Such supersensitives have actually thus proven capable of becoming acquainted with the secret or unconscious thoughts of other individuals in the same room with themselves, or in another house, or at some far-distant place as effectively as a good physiognomist reads the meaning of expression on faces. During the procedure they neither observe nor reflect rationally, but they simply are aware or know whereof they speak. They appear to participate in a medium much larger than themselves, as passive transmitters of a movement along invisible wires.

Under conditions of emotional stress, personal information of critical occurrences may be telegraphed or radiated, as it were, between two individuals—even those ordinarily obtuse to such influences—although they may be at far distant points. It is sometimes easier to transmit such thoughts over long distances from one individual to the other than when they are together. In its milder, more inchoate form, the same kind of supernormal psychation may be the basis of the intuitions that cause certain people to pick the same ideas out of the air at the same time, as has happened in the history of science and invention. In its more acute and frenzied manifestations it appears as inspiration that arises out of a feeling of certainty without a rational basis, but justified by later facts.

Also there are a number of verified episodes where one individual has been almost instantaneously informed of the suffering or death of another thousands of miles away. A phantom appears to a relative or a friend at the very moment that he is the victim of an accident or about to die. He may disappear as suddenly and silently as he appeared, or he may announce his death or misfortune. Clairvoyants, far away from the scene they describe, may tell of it with photographic minuteness, although more often they mention only fragmentary happenings. The participants and sequences of such incidents are

described with a fidelity that a later checking demonstrates to have been amazingly correct.

Such clairvoyance and telepathy have about them the certainty of a direct perception. A certain previously existing psychic bond between the communicators seems to facilitate the functioning of supernormal psychation. Those who have investigated the details of the underlying ties between the individuals concerned have reported a number of instances of its workings that were seemingly dependent upon the psychic closeness or emotional intimacy of the participants. Mother and child, or lover and beloved, as well as physician and patient, are all more deeply involved than usual in that intimate intercommunication to which the concept of *rapproch* is applicable. Another way to put it is to say that a facile transfer of the libido, because of a minimum of resistance, is possible between them.

7. MODERN ATTITUDES TO ABNORMAL PSYCHATION

The concept of psychic transference has been reinforced by an accumulation of so many reports of these occurrences that their existence can no longer be doubted. In their most marked manifestations they appear to be limited to those who would seem to be peculiarly receptive to their functioning. But there are also many possessing these telepathic or clairvoyant faculties in a rudimentary or latent form who may be made more proficient in it by practice.

A number of deliberate experimental demonstrations of the presence of telepathic and clairvoyant powers in apparently ordinary persons have now been attempted. They are much like those carried out by Gilbert Murray and his daughter. While one concentrated upon a picture in one room, the other, with a mind as relaxed as possible, recorded what might be transmitted. Pictures presenting themselves to the eyes of one were completely reproduced in the imagination of the other. Drawings made by one were copied with almost photographic fidelity at times by the other. Other experiments have resulted in quite astonishing facsimiles of drawings, the results of which were definitely indicative of parallel visualizations.

Another approach to the possibilities of psychic intercommunication in apparently normal individuals has been tried by the American psychologist Rhine, continuing earlier work of French and English observers dating back to the 1880's. Simplifying and standardizing the technique of his tests, he carried out experiments which seemed to demonstrate that the occurrence of psychic intercommunication is not as rare as hitherto considered. Rhine recorded his findings

systematically. He put them in the form of strictly scientific protocols, and quantitated them as much as possible. Working with the aid of mathematical calculations of the probabilities, eliminating the factor of chance coincidence, he claimed to have proven that clairvoyance and telepathy are the peculiar possessions of certain human beings, much as musical ability or mechanical faculty. By his procedures persons possessing such psychic powers can be detected with greater frequency than has been the case with previous methods. Those who are clairvoyant in such laboratory tests also tend to be telepathic. The proportion of hypersensitives tested in various groups turned out to be about one in five. In spite of certain doubts raised by possible fallacies in the mathematical background of his conclusions, their general tendency reinforces the basic conception developed by other lines of evidences.

Extra-sensory perception, it is evidenced, tends to function at about the same level of capacity when tested at different times, fluctuating with fatigue and distraction as do the results of an intelligence test and to about the same degree. That there is a definite connection between the state of the nervous system and the functioning of extra-sensory perception has been proven by the action of depressant and stimulant drugs such as caffeine and bromides. Depressant drugs, such as amytal and the bromides, practically abolish the extra-sensory faculty. Stimulant drugs, such as caffeine, raise its efficiency. *The subject must be relaxed, unself-conscious and concentrated.* At the same time *he must will his achievement*, he must activate his interest in the functioning of his faculty and make a strong effort. There is some evidence that the tendency to clairvoyant psychation as exhibited in the laboratory test seems to be inherited, or at least to be more frequent in certain families. At any rate, a certain correlation of its power in different members of a family has been reported.

But these laboratory studies are recent and limited compared with the accumulated reports by physicians, physicists, astronomers, psychologists and other trained observers, of a host of phenomena to which they can only be considered subsidiary. These have for long been regarded as belonging to the borderland of the credible, a no man's land of claims and matters so debatable that they have been taken to be in the most direct conflict with the concepts and methods accepted as the very foundations of the modern mind. But it seems that this view will have to be revised. The recorded observations are diverse but they all point ultimately to one conclusion: that there is a form of collective psycho-activity not taken sufficiently into account

by either common sense or orthodox science. They are tremendously important additions to the evidence for the concept of a life-personality, as these phenomena are precisely what we would expect to find in a collective consciousness and its diffused psychation.

8. PSYCHIC RELATIVITY OF PAST, PRESENT, AND FUTURE

In the unconscious, freedom of psychic movement and association in relation to time and space seems much more fluid and plastic than in the conscious. Sometimes pictures emerge from the unconscious in dreams which seem, as it were, to anticipate or prophesy coming events. The experience of tomorrow may thus be foreshadowed in the dream of today. From the most ancient times the anticipatory quality of dreams has been taken to be their true function, as witness the scriptural story of Joseph and Pharaoh's dreams. This prophetic interpretation of dreams has been continuous from that time in Egypt to the modern carefully recorded observations of the English engineer Dunne and his friends concerning the anticipatory nature of certain of their own dreams. They have studied their experiences methodically and scientifically by putting down as much as they could recollect of their dreams immediately upon awakening. Subsequent checking of the movements and history of persons and incidents appearing in the night life of their minds has made possible the understanding of their dreams as veiled perceptions of what was to happen later. These dreams, indeed, have registered knowledge of a coming event, of what was *still* to occur, as far as the conscious was concerned, but which *had already occurred for the unconscious*.

On the road of space-time, the unconscious runs ahead of the conscious. Such dream anticipation can be correlated with telepathy and clairvoyance in certain respects. It cognizes the occurrences of the future as if they were occurring within or upon its plane of the present. These observations check with similar anticipations of telepathy and clairvoyance, in that a psychic relativity of the past, present and future is indicated.

A radio broadcast in Manila on a Sunday morning is heard on the preceding Saturday night in New York because the velocity of electromagnetic waves carrying it is so much greater than the rotation of the earth away from the sun by which the alternation of day and night is determined. The relativity of ordinary or normal perception of time to the range and speed of sensation is obvious under the circumstances. A psychation that ranged over its field of activity with the speed of light would cover, as its area of the present, a much

vaster territory that is included in the normal encompassing flashes and pulses of its consciousness. If the right connections could be made, as it were in its field of activity, what was past and future to a more limited perception would be linked and merged in its greater present. All would be included on the horizon of its immediate vision and conception.

It there were a life-personality including within itself the unconscious psychation of all its individual constituents throughout space and time, connections between itself and any of its sub-personalities could be established, which, emerging into his consciousness, would appear as an abnormal knowledge of the future. The range of the present for any individual consciousness is distinctly of much smaller extent. It regards the present as that which is actually or potentially embraceable in its immediate field of vision, limited to the radius of stimulation of its eyes. But the unconscious is not as limited by the sensory organs as is the conscious. That law of its functioning has been established by a number of supernormal facts and faculties exhibited by certain human beings who are sensitive to them.

It is through such still poorly recognized sensitive carriers and meagerly understood extensions of unconscious psychation that there function those human hypersensitives who possess, at times at any rate, powers of perception, understanding and cognition inexplicable by ordinary standards. Through what is apparently a direct contact with the most minute occurrences in every organ and tissue of their own bodies, or in those of others, they have revealed, for example, a knowledge of disease in the organs within them. The reception into the unconscious and translation into the conscious of such hypersensitives of the events in the lives and functions of the constituent cells of their subjects indicate that there are constant contributions to the individual unconscious, from the smallest protoplasmic units of the body, rivulets of micro-psychation converging into the larger stream of the individual unconscious, which normally remains repressed and unknown to the consciousness of its possessor.

According to Osty, Geley, Boriac, Richet, Flammarion and other students of these phenomena, the supersensitive is as independent of time as of space in his perceptions. Not only is there accessible to such a supersensitive mind the succession of incidents of the present life of the subject of his clairvoyance but also of those that have woven the web of his life in the past, of which he has no conscious recollection at all. Even more amazing, there may be envisioned the adventures and vicissitudes of the future, which cannot be explained

in terms of the individual's unconscious precognition. These may present themselves to the clairvoyant's psychation as clearly as do the memories of the past to one who belongs to the so-called normal in all the processes of his thought and mental behavior.

Nor is the psychation of a clairvoyant limited by the boundaries of birth and death, according to these observers, for it may reach backward toward the experiences of the ancestors of his subject and extend to those of his descendants. Moreover the range of such supernormal psychation appears not to be interrupted by barriers in the material environment. The supersensitive individual may exhibit a most uncanny acquaintance with the character of the soil upon which he plants his feet. The presence of springs of waters deep in the ground, of stretches of coal or oil, or veins of precious minerals deep in the bowels of the earth, are known to him. It is as if such a human being produced in himself a psychic photograph of all that is around him. He seems not to be dependent upon the interpretation of shadows and densities, as is the radiologist who studies X-ray pictures, but appears to know directly and definitely the nature of the territory within his ken.

If what has been reported of this supernormal psychation, which is active at certain times in their lives in at least a few human beings, were to become generally distributed and therefore normal, human beings would have from each other no secrets of thought, character, health or disease. As if unrolled by a film, their biographies would be revealed by their mere presence, and also their relations with persons and things and the entire contents of the milieu in which they lived and moved. The past, present and future of each person's associates, acquaintances, strangers or aliens as well as friends and relatives, characteristic and specific happenings of their lives, would be as readily available to him as is the star picture of the sky to an astronomer who has laboriously studied it. There would be no barriers of space-time to man's psychation, so that he could effect communication with persons both known or unknown to him, far-distant or near, and observe them and their doings as if they were thrown on a television screen. The meanings and correlations, the complete details of the plot, incidents and episodes involving these same people, would also be perceived by him. Perhaps, in view of the ensuing complications of such a gift, it is well that normal human beings do not possess this faculty.

No one human being has ever realized all of the potentialities and capacities of supernormal psychation. Actually they have occurred

only partially or in some specialized form, such as the ability to tell where water, coal, oil or gold was hidden, or to foretell the fate of a given person, or to visualize what was happening at a distant spot, or as a disclosure of some otherwise undiscoverable secret. But the generalized possibilities of these supernormal psychations which embrace the contents of all of the human world, all the details of the past as well as the shapes of the future, cannot have any defined limit set to them in time or in space. Always most shocking and least easily acceptable to the logical and scientific reason as well as to common sense, are those clairvoyant perceptions which have to do with the future, which touch it at points completely unpredictable by ordinary consciousness, and which make of time an infinitely extended present. These, varying from vague premonitions and presentiments to clearly prophetic visions and anticipatory dreams, violate every canon of the intellectual constitution by which everyday life proceeds. Yet the welcome bestowed by science upon every kind of experience must be extended to include them. It must test, analyze, standardize and finally incorporate these extraordinary perceptions and cognitions, if any really comprehensive system of the physical universe and its psychic phenomena is to be achieved.

9. THE BACKGROUND OF A COLLECTIVE SUPERCONSCIOUS

Though a broadening of the possibilities of simultaneous perception in space is familiar to us, a similar extension of perception in time still seems marvelous. But to a collective superconscious functioning in a multidimensional network of space-time, an all-pervasive and inclusive superpersonal psychation, one is as possible as the other. The only concept which can at once include and explain these phenomena taken together is that of a superpersonal superconscious subsuming within itself every kind of psycho-activity. An all-embracing awareness of every happening in the world of physico-reality by which some individual psychation is being affected or has been or will be affected, would function in an ultrahuman framework of time and space. In this the past, present and future are similar to the human and yet of different duration and co-ordination.

Continuity of psycho-activity among all the living is what we would expect if the life-personality is really a singly integrated being. Such continuity of psycho-activity is the inevitable and intelligible corollary of the existence of such a being. It alone is consistent with the range and depth of the life-personality's dynamic connections with all of its parts, as well as with the universe as a whole. The human imagina-

tion does not have to be stretched and strained beyond the logically bearable in assuming the existence of this all-comprehending net of psychation.

Can we form a picture of the relation of individual consciousness to this collective superconscious of the life-personality? The ego consciousness, the one immediately given and undeniable fact of psychation, as Descartes pointed out long ago, is mediated by the billions of brain cells that constitute the aggregated gray matter of the human brain. Each one of these cells, the neurons of the cortex, must be presumed to be capable of a certain primitive psychation, an elementary sensitivity, perceptiveness, and reactiveness. It must possess the ability to learn and remember, directed to the same primary goal of self-maintenance and self-regulation as has been demonstrated for the amoeba and other single forms of life which it so much resembles. Yet out of the coalescence of the psychic activities of these billions of cells, a single, a definitely though loosely concatenated personality, a unique integrated individuality, emerges which functions as a self-contained dynamic system, an integer of psychation, unified out of the multiplicity of its subordinate and subsidiary systems.

These cells of the brain continue to live and to maintain their identity as individuals as well as their roles in groups and complexes. They become functionally linked to one another and thereby to the psychic entity which is the emergent personal consciousness. They constellate and organize themselves into patterns of association and dissociation, in response to the needs of the organism. No one knows whether the individual brain cell has any awareness of its relation to its group or to the human totality in which it is incorporated or of its function in the whole. But there can be no doubt that taken together they form the matrix of a psycho-continuum to which their interactivities contribute. Thus they are actually living for the sustenance and progressive evolution of a personality more significant than themselves.

In other words, the individual's consciousness and also his unconscious, functioning together, constitute a collective superconscious for the psychation of the cellular units, the protoplasmic building stones, out of which he is constituted. Higher and higher levels of superconsciousness and subordinated and contributing subconsciousness can be conceived as arising between progressively larger and larger groups of individuals and organisms. Becoming more and more complex until the highest levels of the life-personality and its psycho-continuum are reached, including them all in the totality of its network, the psychation of which knows them as one.

There is a complete parallelism between this picture of the brain as a composite of brain cells and the make-up of the life-personality as it is constituted out of its sub-personalities. Each of these seems condemned to live with its own little conceits of egocentricity and within the orbit of selfish isolation, denying or ignoring that which transcends its own limitations in space and time. Nevertheless their combined psycho-activity constructs a great pool of universal knowledge, memory and prevision into which a dipper may be lowered by one or another of them for information which cannot be interpreted in normal terms. Yet when such supernormal cognition is analyzed, it is found to operate according to the same laws of association and dissociation that function in ordinary psychation. And that is what convinces us that they must be of the same nature throughout, both in the individual and in the whole.

When hypersensitives exhibit their supernormal faculties in the collective psycho-continuum, they act as if they were cells of a larger, more inclusive being. They behave as if they were able to establish contact with other cells in that being, or with its psychation as a whole, and to obtain in consequence a knowledge present in the various and innumerable points of contact made through the network thus constructed. In every particular they resemble the cells of the nervous system, the neurons, each of which is a functional unit with no direct anatomical continuity with any other functionally related cell in the total structure of the brain. Among the neurons, action of one cell upon another is achieved through a "make" and "break" effect at the point of possible junction between them known as the synapse. In the nervous system a practically infinite number of uniting ramifications and connections are made possible through the permutations and combinations of association of the synapses. In the collective psycho-continuum, a similar practical infinity of ramification and connection is possible in accordance with the working of the same laws of association.

In studying hypersensitives who exhibit their faculty in its most pronounced form it has been found that even material residues of association, such as an object that has been touched or handled by the subject of the experiment may act as the intermediary between the psychic percipient and the collective psycho-continuum of the superconscious. It may almost immediately produce psychation concerning the person who has previously touched it, and an expression of information concerning that unknown person's life. As soon as the evocation of the personality involved has been attained, the object

that aroused it may be removed or destroyed but the process continues. The shape, size, physical or chemical nature of the object makes no difference, but the objects which act best are those with which contact has been frequent and prolonged, and which have not been touched by others. If the article has been handled by others, these persons too may be evoked and described. However, the life histories do not come up in the order in which the persons have handled the object of contact. To get the personality whose life history is desired it is sometimes necessary to run through and dismiss a variable number of others.

The associative effectiveness of an object apparently depends upon its having been touched, that is, upon the establishment of an invisible bond between the object and the person who has handled it. The strength of the association would seem to vary directly with a certain quality in the person, some kind of physical rapport between his sensitivity and the object. Some remnant of that relation apparently serves as an emanation from the object. However, objects cannot communicate to each other whatever it is that human beings or living things communicate to them. Only an object which has had direct contact with the human being under consideration can serve as an intermediary between that person, distant though he may be in space or time, alive or dead. What is even more startling, such an object can serve as intermediary associant with that person's deceased progenitors or with his descendants still to be born.

When such supersensitives display supernormally communicative states of consciousness under the influence of inanimate objects, their communications may be regarded only as evidence of interpersonal or collective psychation in which the objects function as foci of association. They prove nothing concerning the survival of human personalities as entities after death nor do they provide any justification for the interpretation of hallucinatory images of deceased individuals that appear in seances as phantasmal manifestations of the dead. Such apparitions may be explained as due solely to the persistence of their psychic experiences in the collective superconscious of the life-personality, much as images of individuals remain in the unconscious memory of any human brain and may be recalled to consciousness through association.

Actually these supersensitives do not attain true images of what they are talking about. Even those who achieve their visualizations by gazing into a crystal, a mirror, or a lens summon only phantoms of their own imaginations, worked up out of suggestions and flashes of

reconstruction. They remind one of the way the unconscious works in dreams through the shifting threads of free association. In getting in touch with the collective superconscious or the psycho-continuum of the life-personality, the communicator acts and talks as if he were in a dream, and the results produced he interprets as a modern interpreter of a dream would read its images and symbols and final message.

Extensive explorations still remain to be carried out in the field of the science of collective psychation and intercommunication. Its fundamental observations and the possible reasons for its errors and mistakes, its failures as well as its successes, will have to be carefully and thoroughly investigated. A beginning has been made. Facts, many facts, and still more facts will be amassed, critically scrutinized, experimented with under controlled conditions and classifications. Nevertheless, enough has been learned and verified of these supernormal psychic communications and of the bearers of the faculties behind them to show that they are consistent with the evidence—which is supported from so many other directions—of the existence of a life-personality, with a continuous memory and psycho-activity, conscious and unconscious.

10. PSYCHOANALYSIS AND THE SUPERCONSCIOUS

The psychoanalytic movement has also made its contribution to the recognition of telepathy and clairvoyance as facts of experience. The unconscious can be the source of telepathic communication, when there is a sufficiently close emotional rapport between the individuals concerned. The openness of the unconscious to all sorts of outside influences suggests that it may be the locus of all telepathic, clairvoyant, precognitive and other supernormal psychic effects, the effects of so-called extra-sensory perception.

It is interesting that the founder of the psychoanalytic movement began by derogating the possibilities of telepathic transmission between individuals as mere wishful thinking. In his classic *The Psychopathology of Everyday Life* published in 1904, Freud wrote that telepathic and clairvoyant experiences were essentially traceable to projections from the unconscious of a desire for something to come true. And he cited several incidents which could be explained as such rationalizations. But in his *New Introductory Lectures on Psycho-Analysis* published years later, he presented a much more respectful attitude toward these occurrences and suggested taking seriously the "objective possibility of thought transference and therefore also of telepathy." It was in 1882, when Freud was an intern

at the General Hospital of Vienna that the word telepathy was coined by Myers and defined as "transmission of thought independently of the recognized channels of sense." It was not until 1933, fifty one years later, that Freud admitted the validity of that definition, and twenty-nine years after he had expressed his initial skepticism.

Freud was impressed by the evidence of several of his patients, who, consulting so-called fortunetellers for a forecast of the future, were given answers which indicated a transmission of secret wishes and thoughts in the unconscious such as a desire for the suicide of a rival, or the consummation of a marriage. It was not that the foretellers' predictions actually came true, but that they were a reading what their clients wished to have come true, as was brought out in the course of the analysis. In other cases, in the analytic conversation patients produced association of names and numbers, that were first present in Freud's own consciousness, and which could not be explained as coincidence or logical connection. Freud even claimed at the end of his discussion that "psychoanalysis has prepared the way for the acceptance of such processes as telepathy," and also that "the telepathic dream, regardless of its stimulating role, reflects like a mirror the contents of the unconscious mind of the agent paralleling it by similar contents in the recipient's mind which are shaped into a personal dream." In other words telepathy may occur between two individuals only when they are asleep, and the unconscious of the one is opened to the unconscious psychation of the other.

Freud also suggested that telepathic communication might very well be the agency of the communal will in the great insect states. An insect society has been often referred to as a superorganism, that is, an organism composed of organisms, the members of the community functioning as subordinated parts, even though they are discrete in themselves. Their different castes, workers, drones, warriors and so on present a differentiation of structure and function corresponding to the division of labor among the organs of the vertebrate body. A single insect of such a community is incapable of prolonged self-preservation and survival apart from its other members, as the separate tissues and organs of the vertebrate body are incapable of independent existence and self-sustenance. And the co-operation between the members of such insect societies is comparable to the co-operation of the cells of their own tissues. But while these cells are integrated by the blood vessels and nervous-system filaments, the insects are spatially separated and constantly changing their local relationships. Yet something holds them together as if by an invisible circulation

and nervous integration. If these insects possess a certain telepathic and clairvoyant sensitivity to one another in addition to their special senses, their remarkable co-operation is explained.

11. THE SPAN OF THE UNCONSCIOUS AND THE SUPERCONSCIOUS

In the picture of the history and dynamics of the life-personality that has been evolved by investigation of the various panels of psychation as well as its methods of protoplasmic variation and mutation, the manifold roles of the unconscious have become manifest. The range of its activities and connections form a spectrum that stretches from the personal to the collective, from the familial to the racial. If consciousness can be compared to a strip of white light, the unconscious and the superconscious may be likened to long ranges of black on either side which fuse in a continuity that has no defined limits or boundaries. All are co-ordinated as are spearhead and spear shaft in the onthrusting ventures of life.

The evidence for the formative, architectonic unconscious was uncovered in evolutionary recapitulations and repetitions during embryonic development. As recently appearing life forms review in their embryonic life the sequence of fish, amphibian, reptile and mammal, they remind one irresistibly of the patterns of behavior performed under the compulsion of unconscious memory. Thus the laws of association that regulate all the movements of psychation, conscious and unconscious, seem to govern also the emergence of the simplest organic patterns of species reconstruction. Even when the recitation becomes hurried and attenuated, as if the individual were rushing through something forelearned in order to arrive quickly at the most lately shaped and completed stanzas of the epic of its creative powers, there is every indication of reminiscence and unconscious memory. The dynamic analogies and fundamental similarities displayed in the workings of the ancestral unconscious and the personal unconscious are overwhelmingly convincing of the identity of the underlying process and energy at work in both. No matter what the concomitant physical and chemical mechanics may be, the facts stand out upon the psychic level as demonstrated and consistent.

The personal unconscious, consisting of those tendencies and habits, learnings and skills, complexes and attitudes that have been gradually acquired in the course of a single lifetime—particularly during inarticulate infancy and early childhood—possesses powers for evil and good, for creation and destruction, that no student of individual psychation can overlook. Merging with the ancestral unconscious

that has led up to its appearance and of which it is an outgrowth, it continues its lines of growth, normal or abnormal, like a swelling river going out to the sea, the great ocean of the collective super-conscious. The personal unconscious possesses direct lines of continuity with that which has controlled and directed and accumulated the accretions of its past history, the psychic forces at work within the life-personality itself.

The contents of the genetic or ancestral unconscious emerges out of the life-personality as it has developed in the appearance, survival and evolution of plants and animals that preceded the emergence of man. He, as the superanimal, is now at last becoming conscious of his origin and destiny, and the meaning of his kinships with the totality of living things with which he is co-ordinated. The personal unconscious may be likened to the Gulf Stream which maintains its identity for a time, but loses it finally in the sea. So too, the stream of the personal unconscious empties at last into the tremendous ocean of the ancestral unconscious. Out of that ocean are presented to the emerging individual the recollections and tendencies of the members of the genealogical rivers which have contributed their protoplasmic substance and psychoplasmic drives. In the succession of the generations, there recurs the temporarily individualized unit, a unique condensation in form and substance that appears as a seemingly isolated system, the discrete self and its consciousness.

In each individual those physical and psychic experiences of his ancestors which have penetrated their genes and chromosomes and become embedded in them by force of repetition or intensity, or as the effects of psychic or physicochemical shock and crisis, survive as the ancestral unconscious. Out of this common trunk of the ancestral unconscious there arise the larger branches of influence in different individuals whose effects upon the personality and conduct of the individual cannot be denied or ignored. These branches of influence are the outcome of life lived in the same environment by hundreds of generations who have been dominated by similar figures and symbols of the imagination for scores of generations. The Arabian desert nomads and the Mongolian rice-field cultivators, the Negro jungle dwellers, the Mediterranean sea adventurers and Aztec warriors exhibit the recurrence of these in their psychation as in their physiognomies. So it becomes possible, to an appreciable extent, to recognize the psychic power of inherited local tendencies and interests, of lingual and geographic variations, of group deviations and differentiations due to specializations of interest and experience in the

relatively more recent history of the unconscious. But much more profoundly fixed are the underlying contributions to their psychation of the deepest layers of the collective unconscious, which may be found the world over in all the groups and strains of humankind. These run parallel to the fundamental similarities of body and mind and of chemistry and anatomy and physiology which reveal the identity of the basic pattern of their common origins and kinships. And including both the personal and collective unconscious as well as all individual consciousness throughout the living world, behind and above them all functions the collective superconscious.

In the ancient mythology of the Scandinavians there was a tree, the Tree of the World, Yggdrasil. It was an ash tree, the roots and branches of which reached everywhere, binding together the earth, heaven and hell. That tree is the perfect symbol and image of the range and span of individual and collective psychation, of the individual and collective conscious and unconscious, and of the all-inclusive psychic circulation at the heart of which is that which may be called the superconscious. In the totality of the tree's structure the individual may be a leaf or a bud, rootlet, seed or fruit.

In that light individuality is not then wholly an illusion nor yet a stark entity. But its apparent isolation is a delusion of limited knowledge. For bonds visible and invisible weave all of its life along every direction of time and space into the substances and energies, the background and association, of every other living creature that is, has been, or will be, within the psychic collectivity which unites them all into a single being.

Now the question arises: is that single being—the life-personality itself—alone in the cosmos and is its collective superconscious limited in its activities only to that earth upon which its members live out their lives? Even if the individual consciousness is not lost in aloneness, is that largest personality, the only true integer of life, an isolated phenomenon in the universe, struggling in its own higher loneliness with cosmic desolation? There is a body of evidence which indicates that such is not the case, and that the psychic energy of the life-personality stems from a cosmic psycho-activity to which it is bound in substance, function and evolution. The earth has been fitted and prepared for the appearance and progress of life by a cosmic process. And furthermore, the essence of that cosmic process is psychic in nature and structure, and that life and that process are integrated in a single cosmic plan and movement.

7

A WORLD PREPARED FOR LIFE

LIFE IS A COMPOSITE CONSCIOUSNESS AND MULTIPLE PERSONALITY, incorporating all the varied manifestations of plants, animals and human beings, scattered far and wide over our planet. Yet the genetic continuity of all the living indicates that life must have appeared upon the earth at a particular time and place, at a particular stage of planetary history. Before that, nothing was alive because it was impossible for any form of protoplasm to live under the existent physical and chemical conditions. Out of the protoplasm that originated when conditions became favorable for its appearance and survival, all the living creatures of the past and present have evolved.

It is certain that protoplasm has possessed some sort of psychic life from the very beginning, since its most primeval form has disclosed a characteristic association of matter, metabolism and memory. This metabolizing and remembering, self-organizing and self-reproducing protoplasm has generated the amazing parade of existing species and individuals. Drastic changes in natural conditions assisted certain of these variants to survive because they were more adapted to the mutations of their environment. Others failed under test and were doomed to extinction because they could not adapt themselves. The marvelous variety and curious diversity of the adaptation of living beings to their environment have long fascinated observers.

1. MUTUAL ADAPTATION OF LIFE AND ENVIRONMENT

Adaptation consists of a certain harmony—something like the relation of the various parts in a musical composition—between the circumstances of an environment and the characteristics and abilities of the living organism carrying on within its range. The striking mutual adaptation of life and its milieu enables its forms to survive and reproduce with a minimum of friction and a maximum of economy of energy. It represents a balance, favorable to the living creature, between the constructive and destructive elements and

agencies operating within and without itself. Especially since Darwin, the environment has been considered the primary and aggressive, the organism, the secondary and yielding, in this relationship. It has been taken for granted that the plastic personality of life has been compelled to allow itself to be molded by the sculpting forces of nature. When nature has changed in its modes or methods, life forthwith has had to change or perish. Such selective molding has brought about those wonderful specific adaptations of living organisms to their climate and surroundings. Organisms are found in their proper places where they function easily and smoothly, that is healthily. Taken out of them they are destroyed by their incongruities.

Nevertheless, given time, life transported to a new environment and novel surroundings and conditions, will adapt itself and survive. This ability to adapt to a changing or different environment is one of the most remarkable and outstanding of its powers. Of what this adaptability consists, how and when it works, has long been considered one of the prime mysteries of biology. Charles Darwin believed and brought forward a mass of evidence to show that adaptation was mainly the result of natural selection, essentially an effect of chance. But long before Darwin, Buffon, Lamarck, Darwin's own grandfather Erasmus and other pioneers had claimed that the living organism itself might decisively and actively participate in deciding its course and fate in the face of the challenge of the environment. There is much to indicate that they were right.

It is obvious to the most casual observer that organisms are never quite the same from one generation to the next. Except for twins, the individuals of any family of any species are born unlike. Some of these variations, maintained from one generation to the next and repeated over a long period of time, fit into the demands of the environment and become adaptations. Others do not happen to fit, become anachronisms, and so are doomed to be discarded in the struggle for survival. Fifty years ago, all adaptations were glibly explained along these Darwinian lines as the effect of the advantages gained by the collaboration of the congenital variation and the environmental demands. But there are many objections to the acceptance of this solution of the whys and wherefores of evolution. Apart from the specific adaptations of species to their particular environments, there is another even more important harmony, a most far-reaching adaptation, between the necessities of all living or organic beings in general—life itself—and the conditions and properties of the nonliving or inorganic in general—the environment as a whole.

All the living are adjusted to the totality of their habitat by forces without and within themselves. This configuration of life and environment-habitat fulfills certain necessary general specifications for their coexistence. If there were not this coadaptation of the organic and inorganic, life would not have survived anywhere. One can infer this from certain universal characteristics of the living substance, protoplasm, which contribute essential prerequisites to the character of all its species and varieties as related to the environment from which they sprung. These combine and are the result of a number of unique properties of the land and sea, the sun and atmosphere of our planet, as well as of their constituent elements. Without these properties life would not have survived anywhere, nor have adapted itself in a progressive evolution under any other conditions.

There was once a time when there was no life on the planet. That is a certainty for the data of the geological record are unequivocal. Things were too hot and too changeable for any living organism to have endured for a second. Then as conditions became stable, and a certain dynamic equilibrium was established, life appeared and commenced its slow evolution. In the process, a group of imperishable memories accumulated as the background of its personality. By following these memories to their beginnings a tree of Life is revealed.

Tracing the course of these developments, Life arose out of the earth, out of the dust and waters. A colloidal jelly, protoplasm, the substance of life, was generated out of the elements of the planet. There is an indissoluble kinship of life with the earth and its elements. The earth was its mother and there was bound to be mutual adaptation of mother and child. But the mother would have turned to rend her child, to devour it impersonally, if the infant had not been possessed of an adaptability to her moods. All the tactics of the strategy for the survival of life in the struggle for domination between itself and its environment would have been in vain had it not been favored from the start, even before it was born, by certain predisposing circumstances.

2. COSMIC INDIFFERENCE TO LIFE

In the ancient cosmogonies, wherein the earth occupied the center of the heavens, man, the symbol and lord of life, was the center of the earth. Olympus and Hades, the gods and the demons, were also present in a co-ordinated whole, but they had significance only in their relations to this all-important human race. All was a single anthropomorphic system. In the world picture of modern man,

however, life is proclaimed a minor digression of the cosmos. It seems a skin disease of the solar satellite, a noisy fuss in its locale but insignificant to the rest of the universe. The diagnosis is wholly acceptable if we believe that the emergence of life on this, our earth planet, has been entirely fortuitous.

In that picture all the living components of the life-personality are ineluctably stranded in a cold and indifferent universe, the resultants of a lucky fermentation spreading over one of its tiny bubbles, a by-product of the great god, Chance. As an orphan of the cosmos, a foundling of no permanent standing among its respected and ancient and universally dominant mechanical laws, man is the mongrel offspring of the interplay of a few of the lighter elements astray upon the surface of a parasite of a lesser and aging star of a minor galaxy. And so the universe can have no intimate meaning for him, nor can he have any significance for the universe.

Upon the spinning globe that whirls obeisance to its sun god, the little beasts and the little vegetations crawl and fight and love and pass away. But neither the earth's sun nor any of the other countless suns of the countless galaxies nor any other content of the cosmos knows or recognizes their coming or going as of any moment or consequence. Man is as alone in that cosmos as he is within himself. The cosmic pettiness of man is accentuated a millionfold by modern science. The eyes of human knowledge now take in the awful emptiness of expanding space and look down appalling vistas of millions of millions of light years of time. The overwhelming size and extent, the limitless history, of the giant galaxies and star systems dwarf the little life-personality, strong and entrenched as it may be in its own tiny domain of a planet. In that same picture, the universe as a whole is completely lifeless and mindless. The modern scientific model of the cosmos presents it as blindly whirling machine, the more forbidding for its magnificent immensities and majestic impersonalities. It is a mechanism consummately insensible to the existence of this living awareness of its plight. In this limitless wasteland man and life are strangers, strangers in a country without natives, where they can only remain stoic or whimpering in the silences. In the face of these realizations, life is humbled in the dust of its origins.

At its commencement, the earth was as unlike its present anatomy as the germ of a human being is unlike its adult development. It was only after long-enduring phases of change and transformation and of condensation of liquids and solids from aboriginal gases that there emerged the mountains and villages, the rivers and seas. There

was a great cooling and molding of substances and masses. The molecules of matter slowed down the mad frenzy of their dervish dance and became compounded and stable. The vapors became huge rains. Great bodies of water came into being. At long last drifting gases, oxygen and nitrogen, neon, krypton and the others mixed to form air, the atmospheric envelope of the burgeoning planet. At length its surface congealed into a solid crust. Then plastic forces liberated by the labor pains of the earth began the formation of those molecules of metabolizing matter to which the name of protoplasm could be given. That birthday of life occurred perhaps a billion years ago.

Cosmic history has been a flux of events operated by chance according to mathematical laws. All is derived from the chaos of the galaxies, and the slow movement from nebulae to stars and from stars to planets, from planets to protoplasms, was conducted by coincidence operating as the law of averages in the world of universal causation. Such is the history of life many accept as the last word of science.

3. CONCORDANCES OF LIFE AND EARTH

The distinguishing attributes of any psycho-activity: awareness of situation, purposiveness of design, anticipation and direction of results, are altogether irrelevant in that picture. In it there is no indication that the earth underwent a preparation for life, a co-ordinated readying of conditions and substances for the appearance and evolution of living forms. Yet within the very entrails of the cosmos itself, in the properties of its atoms and molecules, its electrons and protons, in the elements and compounds that preceded the emergence of the earth and life itself there is evidence of a correlation of possibilities and realizations that can be interpreted only as preparation.

A unique combination of favorable factors and characteristics of the cosmos, of the solar system as well as of the earth itself were prerequisites for the birth and progress of life on our planet. Even if life were accepted as purely a manifestation of cosmic matter that has become incredibly complex and intricate in its organization, no one could evade wonder at the many conditions that have united to make possible its appearance. Before life appeared, a series of inorganic events had to take place, events that might be called predispositions and predeterminations before the simplest protoplasm could exist or survive. Elements and their correlations reaching into the most intimate, physical and chemical, properties and powers of sub-

stances, and their reactions, produce a *fitness of the environment* for life's emergence.

There is an effect of purposefulness and of preparation in the whole, an aptness of the preceding for that which is to follow, which can never be explained by the action of chance alone. To overlook this is to ignore the facts of modern scientific discoveries which thrust before our eyes the pulsing heart of the entire system in which life is involved with its environment. Various periodicities of climate, for instance, recurrence of day and night, alternation of the seasons, of sunshine and rain, the circulation of energy between atmosphere, land and sea, seem merely to provide problems of adaptation. Yet they also represent a dynamic order of events in nature so useful to all the activities of living creatures that they could not survive without them. They engender a mutuality of fitness in the relations of earth and life such as is left out of the account altogether, if one believes that life is continually compelled to shape itself to the relentless demands of an indifferent, if not a hostile, world.

The present shape and mass of the earth are essential to the continued existence of a complicated chemical system which keeps itself organized by means of oxidation. About the earth is an atmospheric veil which has two functions. It acts as a protective envelope to shield its surface from the destructive heat of the sun and as a chemical reservoir of the prime essentials which feed plants and animals: oxygen and carbon dioxide. But if the mass of the earth were reduced by as much as one third, these gases, released from the weakened grip of its gravitational field, would float away into the void. The very weight of the earth and the constitution of its atmosphere are functionally interdependent and both indispensable to the survival of life.

The atmosphere is uniquely helpful to life in many curious ways. It acts to absorb the more dangerously penetrating of the sun's rays and so prevents the living protoplasm from being scorched to death. It facilitates a more equable variation of temperature on the earth's surface, so that it is not as cold nor as hot as on the other planets, within a range that makes the survival of protoplasm possible. If the temperature of the earth were that of other planets, life could not persist. Liquids vaporize on Mercury and freeze solid on Neptune because they have no atmosphere. Protoplasm must be semifluid to maintain its structure and functions, and it can be so only under our atmosphere. On the other hand, if the atmosphere were sufficiently thick to absorb most of the solar heat, oxygen and hydrogen would unite to make water and fall in continuous torrents to drown life.

For while it is good that oxygen should not escape from the atmosphere, the contrary is true for hydrogen. Hydrogen is lighter than oxygen and constantly escaping from the atmosphere into cosmic space. If it did not so escape, it would again combine with the oxygen to form water in quantities sufficient to inundate all the earth in a flood. As at present constituted, the atmosphere of the earth is without doubt the best possible protection for the life which swarms and breeds beneath it. Its physical and chemical properties provide special conditions for the emergence and continuance of that life such as could be provided by no other medium.

There are a number of other conditions of the earth that are elementary necessities for the survival of life. At least twenty such conditions could be enumerated, all of them essential to that combination of favoring circumstances which have made it possible for protoplasm to live, reproduce, adapt and evolve. Without their copresence, neither amoebae nor orchids, birds nor men could have been evolved. For they are the common denominators of all vital existence, and without them no life of any kind would be possible. Such, for example, is the earth's ecliptic, the angle at which its axis is tilted to the plane of its orbit around the sun. Because that axis points to the North Star, and not directly at the sun, we have rotation of the seasons.

In the first decades of the nineteenth century, an English clergyman, William Paley, was much impressed by these and similar facts as evidence of divine design in the construction of the earth and the cosmos. *Natural Theology or Evidences of the Existence and Attributes of the Deity collected from the Appearances of Nature* is the title of his book on the theme. Distinguished physicists like Whewell, and physiologists like Sir Charles Bell agreed with him. A whole set of works, the Bridgewater Treatises, was published in twenty-four volumes to illustrate the "Power, Wisdom and Goodness of God as manifested in the Creation." To the belief in the divine contrivance of the different species of plants and animals that inhabited the earth was added the faith that all of man's environment was manufactured for him in particular. And so his natural and graceful adjustment to it, as well as that of the plants and animals which served him, was taken as a matter of course. Darwin shocked that naively believing world of the nineteenth century by completely reversing the point of view. Instead of saying that the world was made and adapted for the uses of man, he contended—and brought forward a great mass of evidence to show—that it was man who was forced to adapt and fit

himself to the environment, as to an exacting ruthless and impartial master. And the same reasoning was applied to all his animal colleagues and forebears. His name for that master was Natural Selection: the selective action of the environment. So convincing were his arguments and so multitudinous the facts and observations he marshaled in favor of his conception that the entire doctrine of design, as it was called, the idea of a world designed for life, together with the numerous facts and valid correlations behind it, were swept away into an almost complete oblivion.

4. RECIPROCAL FITNESS OF LIFE AND ENVIRONMENT

After a half century of obsolescence, the concept of prerequisite design was revived by the genius of a biochemist, Laurence Hender-son. Without identifying himself with the older views and their pious associations, he inquired into the meaning of a set of new discoveries in the domain of chemistry and chemical biology that had turned up during that period of neglect. These threw new light upon the fitness of the environment for life. In a direct challenge to those who saw no continuity between life and pre-life in the history of the universe, he demonstrated from these recently accumulated data adaptive correlation between the dominant chemical elements of protoplasm and the conditions of the origin of life. These studies emphasized that the chemical, like the physical environment, was not primarily engaged in a destructive conflict with living creatures, but was actually and uniquely a preparation for them, and an ally in their survival.

Many different chemical elements enter into the composition of the living cells of which animals and plants are compounded. There are some thirty-two of these, including carbon, hydrogen, oxygen, nitrogen, iodine, phosphorus, sulphur, iron and others. And much remains to be learned about their functions in protoplasm. None of them are peculiar to protoplasm for all of them are found in nonliving matter. But of them all the four elements, carbon, hydrogen, oxygen and nitrogen have been most studied because out of their interplay is exhibited most of the constructive manifestations of living matter.

The trio of carbon, hydrogen and oxygen, in particular, possess certain potentialities that are truly amazing when one comes to consider their underlying meaning in relation to the appearance, survival and evolution of life. These three might be called the vital elements. They are distinguished by the fact that their combinations form two of the simplest but most important of all chemical substances involved in the dynamics of protoplasm, making the earth habitable for its

development and progress. These two substances, water and carbon dioxide, are formed when hydrogen unites with oxygen to produce water, while carbon amalgamates with oxygen to form carbon dioxide. One a liquid, the other a gas, these two compounds are unique in their ability to facilitate the powers of protoplasm, both as entities, working separately, and in combination, within its substance, and in its environment.

Water is the most remarkable of all fluids. It possesses properties peculiar to itself that alone have made possible the dynamic equilibrium stabilizing the size and composition of the earth's atmosphere. For it passes easily to and from the expanse of land and sea beneath to the sky above. By its capacity to vaporize easily under the influence of the sun's heat and then to be reprecipitated as rain or snow, water is a most effective plastic force. At work everywhere, it carves and models the shape and substance of the earth surface, because it goes everywhere that gravity draws its flowing substance. As rivers and lakes, seas and oceans, it pervades the scene carrying with it all kinds of chemicals which it has dissolved out of the solid sand and soil and rock. No other known substance can accomplish these unique effects.

Water, by itself, constitutes over seventy-five per cent of the surface of the earth. The proportion is even higher in protoplasm: from eighty to ninety-nine per cent. It confers upon the living matter its most valuable physical property: flowing form. For its molecules can hold together sufficiently to form a firm matrix for chemical reactions—yet they can slide over one another, combining viscosity and penetrability, essential for other molecules that can enter and then be held fast for the metabolism and nutrition of the living substance. Water is the basic medium of the reactions of life. But even before life appeared, it was also the great sculptor of the planet which made the face of the earth what it is today and what it has been for ages, a fit environment for the living.

When carbon dioxide mixes with water there is formed a solution of a most interesting compound, carbonic acid. Carbonic acid in turn will combine with alkalis like soda or potash. Such compounds of alkalis and carbonic acid, carbonates, have unique properties which materially further the equilibratory adaptations and the consequent preservation of life.

Even before protoplasm stirred in its first jellylike beginnings, a preparatory evolution of the earth for its appearance was affected by the action of water and carbon dioxide upon the solids, liquids and gases that were generated by recurrent earthquakes and volcanic

upheavals of its molten masses. All the physical conditions of the planet were importantly influenced thereby. And long before organisms began to drift about in the bodies of water beneath the atmosphere—absorbing oxygen and releasing carbon dioxide—the earth's surface developed a life-furthering geography and a necessary stability under the influence of these two simple universal solvents and corrosives.

5. UNIQUE FITNESS OF THE VITAL ELEMENTS

Thus even before the life-personality was born, the specific ability of carbon, hydrogen and oxygen to unite as water and carbonic acid were working together to prepare the earth for its evolutionary destiny. The properties and powers of these vital elements, carbon, hydrogen and oxygen, reveal a striking series of unique coincidences and singularities in their co-operation with the evolution of life. In fact they may be said to contain within themselves the very seeds of life. Of all the known chemical elements, they combine into by far the greatest number of compounds, of the most diverse properties, and characterized by a most extraordinary chemical reactivity. There are literally hundreds of thousands of such compounds, and they may run into millions. No other elements can approach them in the multiplicity and sensitivity of their combinations, as well as in their potentialities for union with other elements. The chemical constitution of protoplasm in its different forms reflects these characteristics of the nonliving compounds of carbon.

Uniquely distinctive also is the dynamic stability of these carbon compounds, a stability which is essential to the preservation of life. Carbon-hydrogen-oxygen compounds under the influence of catalysts are notable for their ability to form complicated substances which will maintain their inner integrity under the most varied conditions. Another outstanding quality is their ability to change their valences so as to capture and release energy in the various mutations of their compounds with a most unusual facility, and yet maintain their stability.

These peculiar characteristics of water and carbon dioxide enter into the most intimate compositions of life, making of them fundamental building stones of protoplasm. Out of them, in association with the contents of soil or sea and aided by sunlight, plants have been able to manufacture the substances which supply chemicals and energy to all higher living things. All varieties of metabolism of different plants and animals depend upon the reactions possible be-

tween water and carbon dioxide, and the compounds formed when they are combined with other elements.

There is thus produced a continuous cycle of events, a circuit of physical and chemical reactions, a circulation of matter and energy, through plants and animals, which is possible only because these vital elements are specifically adapted to them. Without that cycle life could not continue. Plants absorb carbon dioxide from the atmosphere, water and nitrogen containing minerals from the soil, and transform them into sugar, starch, protein and vitamins. These the plant-eating animals consume and assimilate into their own structure and then burn or metabolize so that they finally return to the original state of carbon dioxide, water and ammonia. By such reductions to their original simplicity they become capable again of entering into the cycle. The end result of the cycle is the concentration of energy by the plants in substances which the animals ingest and then concentrate in their own efforts toward a higher evolution. Thus the dissipated energy of the sun is finally transformed into the concentrated energy of the life-personality, a principle most important to realize in any understanding of the relations between man, life and cosmos.

One can imagine life placed in an environment not as favorable, in fact constantly at war with it at every point and on every frontier. An entirely different medium, not water, but some other fluid, such as benzine might have been its liquid substratum. Instead of carbon dioxide, some other gas might well have been its major means of communicating with its atmosphere, as for instance, nitrous oxide or laughing gas. These alternatives would, incomparably, never have served so efficiently as captors of the energy of the sun or as chemical reagents to furnish the huge and relatively stable molecules which are the biogens of consciousness. Of all the possible known liquids and gases which might have preceded the appearance and phenomena of life, water and carbon dioxide are far and away the best adapted to its nature and powers.

These adaptations of water and carbon and carbon dioxide to the functions of protoplasm indicate how closely and intimately there have been provided most favorable conditions for its endurance and progressions. Life turns out to be a personality, maintaining itself in plastically durable forms, through which nonliving matter and energy flow in a cyclic stream. And the circumstances and the substances and conditions under which it survives and develops are

uniquely and peculiarly fitted for its adventures in organization and the complications of its evolution.

Even under the most suitable conditions, the environment is and always has been potentially hostile to life or at least threatening to its manifestations. Every form of protoplasm is subject to sudden death and can be snuffed out by an abrupt change of conditions within or without. Deprived of oxygen, for a minute, or minutes, the whole system collapses. A rise or fall of temperature may coagulate or freeze protoplasm to the point of breakup of its delicately co-ordinated components. It is without doubt the most precariously balanced of all complex physicochemical systems. Indeed it combines the explosiveness and destructibility of gunpowder with the subtle adaptability and perseverance of a river. Upon the dynamic equilibrium, the balanced combination of the factors making for stability and instability, has depended the course of the progressive and complicated development of its organization and functions. Yet it is an undeniable fact that without the presence in that environment of hydrogen, oxygen and carbon and their two compounds, water and carbon dioxide, these subtleties of adaptation would have been utterly impossible. Without them protoplasm could never have arisen out of the cooling mud of its origins or survived its mutations.

If, starting out with the ninety-two chemical elements and the cosmic forms of energy—heat, light, electricity, magnetism—it were possible for a planner deliberately to create an environment for the complex being we call the life-personality, an environment in which and out of which it gains its substance and energy, its security and perpetuation, it would be impossible to construct one better suited than that actually existing. Within the limitations of the available elements, substances, energies and conditions, the most favorable have been united for the benefit of protoplasm. For the history and destiny of life as a whole it is literally true that this planet and its conditions comprise the best of all possible worlds. As regards the ephemeral improvisations of economics and politics with which humanity has been struggling for ten thousand years, Voltaire was unquestionably right when he said that this is the worst of all possible worlds. But in the larger foundations of the universe and the earth as a whole, and the provision of favoring conditions and circumstances for the production of the varieties of the life-personality, and for aids and advantages in their evolution, no better one could have been devised.

6. THE INDISPENSABLE CHEMICAL ELEMENTS

A suitable planetary environment for life depended upon an association of certain essential conditions upon the surface of our earth. Of first and paramount importance was the formation of an atmosphere of just the right chemical composition, remaining fairly constant in its proportions. And that is what happened upon the adolescent earth. One of the earliest events upon the cooling mass which was to become our planet was the gathering and increasing prevalence of carbon, hydrogen and oxygen upon its crust. These vital elements contributed to the formation of the right kind of atmosphere. However, such an atmosphere could exist only if the planet were of a certain size at a definite distance from the sun. It would also have to rotate at a rate slow enough to prevent complete condensation of the carbon, hydrogen and oxygen of its atmosphere in a liquid or solid form. A durable atmosphere is without doubt a prime essential for life. Now, rare indeed as is the occurrence of a planet possessed of the necessary physical prerequisites, proportionately rarer must be the formation of such an atmosphere and the climates that accompany it.

Chance can never explain the peculiar fitness of the earth's atmosphere for the propagation and progressive development of the living. When a correlation between antecedents and consequents in any series is of such a special character, it must be conceded that a preparative activity has been at work. When that activity is anticipatory of needs and conditions to the extent described, it implies a psycho-activity—the activity that functions in situations which involve a co-ordination of what precedes with what follows, so that the former is a making ready for the latter. The fitness of its terrestrial environment for life, as determined by the concurrence of the physical properties of water and carbon dioxide, as well as by the chemical compounds of carbon, hydrogen and oxygen, is of the kind that rules out chance as an explanation.

Again, it is a primary fact that carbon atoms can combine with hydrogen atoms to form a complicated series of substances known as the hydrocarbons, of which the simplest is carbon combined with four hydrogens. Stable combinations of these hydrocarbons with other elements, such as nitrogen, with a greater and greater number of carbon and hydrogen atoms, may be formed. So these simpler hydrocarbons may be transformed into curious long chains and rings or bifurcations, and there seems to be no limit to their extensions.

These are the patterns of the composition of the different forms of protoplasm.

No other element can approach carbon in this peculiar and really unique property, a property which is as favorable to the preservation of the memory and consciousness of life forms as it is necessary for metabolism. In fact, carbon is the only chemical element whose compounds are capable of producing the background for a permanent memory. For they alone possess the qualities which make memory possible: a requisite association of complexity and stability, and a sufficiency of individual variations, and so of individual adaptations to the fluctuations of an environment. In other words, these compounds of carbon have the very properties which are absolutely essential for the maintenance of a continuous psychic life. When oxygen is introduced into these hydrocarbons, a quality of exceptional chemical reactivity is added to the qualities of complexity and stability. At the same time the possibilities of compounds are vastly increased.

No other of the compounds of the chemical elements can enter into a complexity of combination comparable to that of the hydrocarbons. The characteristics explain the fantastic variety as well as the underlying similarity of the enormous numbers of different living organisms. No two living individuals—not even twins or two peas in a pod—are precisely alike. These differences are due to the unique ability of carbon, hydrogen and oxygen to arrange themselves into compounds that are numerous, varied, complex and stable, and at the same time capable of higher and higher differentiations. It is these properties which give protoplasm its fundamental dynamic organization as a self-sustaining system, capable of varying and adapting itself to changes in the environment and yet maintaining its underlying identity and integrity in its psychic life—which makes it psycho-protoplasm. Without these properties psycho-protoplasm would have been impossible.

In addition to their unique ability to provide stability and complexity of structure for metabolizing and remembering organisms, these carbon compounds are singularly fitted to store and release energy, the very essence of metabolism, by attaching or detaching to or from themselves foreign groups of atoms and molecules. Moreover, when such attachable or detachable foreign groups are themselves hydrocarbon in constitution, they do little or almost nothing to change the fundamental physical and chemical properties of the protoplasmic substance, although they can increase its power of

individualization. They are thus best adapted for the transformations of cosmic energy into the energy of life.

Sugar illustrates these effects, one of the simplest substances manufactured in protoplasm. Out of sugar are synthesized the starches and glycogens which can be turned back into sugar through a familiar chemical cycle. Sugar consists simply of molecules of water and carbon dioxide that have been rearranged so far as the internal position of the carbon, hydrogen and oxygen atoms are concerned. In slightly alkaline solution it becomes slowly unstable and gradually transforms itself into over two hundred different compounds. Most of them have different class characteristics, and are capable of reacting and uniting with other substances to form the most varied combinations such as are found in living cells. Sugar may also be split into simpler substances such as lactic acid. As a result of such splittings, it finally becomes water and carbon dioxide again, energy having been released.

Observe how a most fascinating cycle of adapted reactions between the organic and the inorganic is thus displayed. The instability and consequent chemical reactivity of the simplest sugars is entirely unparalleled in chemistry and possesses the utmost biological significance. For without them the living organisms would be liable to lapses of the supply of energy, which would mean extinction. And it is a pertinent fact, that the brain, which maintains the greatest instability of energy, as it has the highest metabolism of any of the organs in the body, accompanied by the greatest intensity of consciousness—feeds only upon sugar of the blood, glucose, burning it constantly into water and carbon dioxide.

7. THE VITAL ROLE OF WATER AND CARBON DIOXIDE

Hydrolysis, the breaking down of substances by means of water, and hydration, the addition of water in syntheses, are in themselves profoundly important for the preservation and reactions of protoplasm. Water has the strange ability to enter into substances and to divide them or unite them simply and directly with a minimum expenditure of energy. Because of such divisions or unions, complex chemical reactions of protoplasm can take place within cells without upsetting its inner dynamic equilibrium or formal structure, for they may be stopped or reversed with a minimum loss of energy. Again, a tremendous advantage in adaptation to the delicately balanced structures of life is seen to be previsioned and provided in its inorganic precursors.

Therefore water plays the most valuable kind of a dual role in

protoplasm. Under the influence of certain catalysts, it can combine with carbon dioxide to form substances like the sugars capable of liberating large quantities of energy. Moreover it affects the complications of carbon, the chain and ring formations, leading to the formation of the most intricate chemical substances in the universe, those participating in the chemistry of protoplasm. And then by entering into these substances it may split them and simplify them, silently and smoothly, with a suavity chemists find it impossible to duplicate in the laboratory. Indeed, water is a compound of a thousand functions, a reagent of a thousand faces, in fitting the environment for the survival and spread of the life-personality.

For more than a century, certain of the life-promoting physical properties of water have been known. For example, one of the most striking properties of water is its unique capacity to float when frozen which results from the fact that it expands when subject to temperatures near its freezing point. Other liquids contract as their temperatures are lowered so that ice is formed at the bottom of their containers instead of at the top, as it is in water. Envisage what a relation this bears to the chances for survival of living organisms in water.

If it were not for this floating buoyancy of solid water, ice, at the approach of winter the coldest water would sink to the bottom of lakes, rivers, seas and oceans and freeze there. The ice so solidified would not melt with the coming of warmer weather, because the warmer and lighter water would remain above it, insulating it from the heat of the sun. Therefore the ice would continually increase with each winter until all the bodies of water would be completely frozen and stay frozen except perhaps for a superficial layer during the summer. As it is, the ice formed on the surface protects the liquid water under it against further cooling and freezing and in fact maintains it at the practically uniform temperature at which its living inhabitants continue to thrive even through the coldest winter. No other known fluid could possibly be put in its place as the substance of oceans, lakes and rivers. No other known liquid could either by itself, or in its combinations, perform so many useful offices for the survival of life.

Again, because its surface tension varies quickly with the temperature, more quickly than that of any other liquid, water can vaporize easily, pass into the atmosphere and saturate it, concentrate as clouds and be precipitated as rain. The frequency and constancy of dew and rain for vegetation are made possible only by this ease of transformation. Thereby the chemical elements in minerals, rocks, and soils have been leached and dissolved, carried away to the ocean or disintegrated,

moved everywhere, suspended in water. All the substances of the earth were thus made available for protoplasm, since when dissolved or suspended they are most reactive chemically.

Water is also unsurpassed in its great capacity to absorb large amounts of heat without much rise of temperature. As a result of this particular property, lakes, rivers and oceans can maintain a practically uniform temperature for long periods of time, even when subjected to the hottest of the sun's rays. A secondary effect is a moderation of the extremes of climate upon the land and in the air. Thus living organisms are not destroyed by sudden changes of temperature in their surroundings. Water is the ideal protector against the extremes of heat and cold which render life practically impossible on other planets.

Most important of all, this exceptional capacity to absorb heat favors the stabilization of chemical reactions within the bodies of the living beings themselves. A rise in the temperature of any chemical reaction accelerates it, with a resulting tendency to disrupt adjustments in cells that are going on simultaneously. A man at rest generates out of his own metabolism about 2,400 large calories when he weighs about 165 pounds. That amount of heat serves to raise his temperature to what is normal—about 98.6 degrees Fahrenheit. But if the heat capacity of his body were not that of water, approximately, but that of most other substances, his temperature would rise to between 212 degrees and 318 degrees. These extremes would be so far above fever temperatures, in fact boiling temperatures, that the proteins and enzymes of the cells would be coagulated like the white of a hard-boiled egg. Such heat could not be eliminated quickly enough, so that during periods of muscular exertion, when much heat is produced, the body would burn itself to death. The self-regulation of the temperature of organisms, absolutely essential for the survival of protoplasm, is dependent upon this unique property of water.

Altogether water is a wonder fluid for it possesses a number of other most desirable qualities for a substance like protoplasm. Indeed it constitutes an irreplaceable medium for the evolution of life. Of the known liquids, only ammonia could in some ways have acted as a substitute, and then only at sacrifice of certain of the most favorable conditions fitting organisms to their environment. In the largest bodies of water, the seas and oceans, water has also contributed to the specific fitness of earth's environment for life. They constitute concentrations of liquid which supply a dynamic balance stabilizing the lands in a number of different ways. The relative weight of sea water, its density as compared with that of the solid earth, is an important

factor in maintaining that balance. If its density were greater than that of land, the land would be flooded by slight changes in the tides.

The water of oceans and seas also represents a complex solution of many chemical elements such as sodium, chlorine, calcium and iodine that can be employed most advantageously by living organisms. Solutions of carbon dioxide, carbonic acid and its carbonates provide a means of establishing an acid-alkaline balance in the bodies of living creatures. Through this means, protoplasm is kept more nearly constant in chemical composition than could possibly be achieved by any other alkali or acid. The combination of water and carbon dioxide as carbonic acid presents a special and unique adaptation to life. At ordinary temperatures, water, in contact with carbon dioxide, will absorb an amount of it just about equal to what remains unabsorbed. As a result the carbon dioxide remains practically equally divided between the atmosphere and the water areas of the earth's surface. The water can never quite exhaust the carbon dioxide of the air, nor can the air ever completely remove the gas from the rivers, lakes and seas.

Consequently, water and carbon dioxide never occur in a pure form in nature but are always found mixed, a fact most favorable for the uses and purposes of life. As a consequence of this inevitable association, plants which feed upon carbon dioxide have it at their disposal on the highest mountains as well as in the lowest valleys. Animals which eliminate water and carbon dioxide in respiration are surrounded by a medium which absorbs them easily and in enormous amounts, then releases them to be used over and over again in the cycle. Moreover, the possibilities of deleterious or even poisonous effects upon protoplasm of powerfully disturbing acid or alkaline substances that are formed during metabolism are prevented or regulated by the action of carbonic acid. Throughout the internal organism, it acts as a buffer against both acid and alkali, both of which have a tendency to overwhelm the intimate chemistry of protoplasm. Carbon dioxide is unique in these powers of neutralizing excessive acidity and alkalinity as well as in its equal solubility in water and air. It is twin to water in the possession of those singular properties which mean so much for the origin and preservation of the life-personality.

8. IMPLICATIONS OF COSMIC ADAPTATION

Under analysis the present environment of life turns out to be by far the most favorable that might have been constituted out of the elements of the universe as we know them. Detailed studies of the

relation of living things to the physical and chemical contents of their milieu have made that evident. It is that very environment that makes possible the unique qualities of the living protoplasm. It makes possible also an increasing complication of memory and psychation which changes the cycles of metabolism into the progressively higher and higher planes of the evolutionary spiral. The paradox of instability in stability and stability in instability which is the paradox of protoplasm, becomes achievable only because of the uniquely assisting qualities of the specifically and specially favorable circumstances in which it has been bred and matured

A magnificent conclusion follows when all these characteristics of the planetary environment are counted. When their concurrent harmonies with the needs of life are perceived and interpreted it becomes irresistibly evident that these can be no accident. No trick of chance could possibly have produced them. By every statistical test of probability, they can certainly not be the by-products of the inchoate gambblings of a senseless nature. Rather do they point to anticipation and preparation, rather are they manifestations of design and purpose, which are the very opposite of chance. In the profoundest depths of the inanimate environment, in the simplest properties of the inorganic nonliving molecules, atoms and subatoms, there becomes apparent a striving toward the realization of life. Nothing else can be concluded from the facts that have been assembled concerning the correlations of the vital elements. The pattern of concatenation proves that there has been a preordination of the earth for life's activities.

For what is the logic used to determine the presence of preparation in any situation or experience? Preparation is inferred whenever there is sufficient evidence of a fitting, adapting, qualifying of substances or energies for a particular purpose, end, use, service or state by any means whatsoever. Suppose one came across a dead body on a road, the question arises: Is this a murder, that is the result of preparation and intent, or accident, that is an effect of chance alone? There is a wound, a trail of blood, a blood-stained knife, a letter arranging for a meeting, and a reference in that letter to what might be a motive for a murder. If there had been the wound alone, the blood alone, the knife unstained, the letter by itself, it would be possible only to guess at what happened. But the interrelationship of the parts, conforming to a pattern unique and singular for the particular event, demonstrates intent and preparation. Chance is ruled out and a preparatory psychoactivity stands revealed.

We regard preparation as established whenever a complex of antecedents is so correlated with a series of consequents that a pattern of a special network of causes and effects is revealed. The conclusion is reinforced when the pattern of correlation between the antecedents precedes by a considerable interval the subsequent manifestations. Whenever we see a plan of action in advance of the occasion when it becomes applicable, we have the right to speak of prescience. Such a preparatory patterning is presented by the properties and conditions of the earth as a whole, in the hydrogen, carbon and oxygen contents of its land, sea and atmosphere, as well as in the two simple compounds of the three, water and carbon dioxide, as interlocking precedents for the emergence and evolution of life.

Any analysis of life and the special fitness of its environment for its manifestations must turn ultimately to its relations to the universe itself. To be sure, the terrestrial rather than the cosmic environment, is the one to which life has had to adapt itself. It is the one out of which it has grown and the conditions of the earth have been dominant in the turns and twists of the contrivances of its pageant. Yet as an offspring of the sun and the rest of the universe, a certain affinity between the local climate and conditions of the earth and the more general cosmic weather and construction of the universe must be expected and must exist.

All-inclusive space and time, matter and energy, stars and the immense stretches of interstellar distances, are the ever-present background of our planet. All its phenomena must be traced ultimately to the cosmic sources of suns and their various satellites. For no matter how small it is, how insignificant seems its position and existence, the earth is a part of those vast whirling masses, the nebulae and the galaxies which are constituted of the same elementary units of energy and matter as itself.

The general chemistry of the universe is constant. The same chemical elements, ranging from hydrogen to uranium, are present throughout its total extent. The hottest stars, the white stars, which are incandescent hydrogen being transformed into its eldest child, helium, become the middle-aged yellow suns—of which our sun is one—containing the light metals, sodium and potassium, calcium and magnesium and iron in gaseous form. These in turn degenerate into the red stars, with little or no hydrogen, but evidencing the presence of the very compounds of carbon, the hydrocarbons, out of which life compounds itself. As there are stars in all the galaxies undergoing a similar evolution, it ought to be possible to infer that life is every-

where submitting to a simultaneous development. All of the stars may have planets, too small to be seen by our instruments, and they may be all supporting forms of life.

Yet the astronomical evidence is almost entirely against the possibility that life occurs anywhere save on earth. Planets are by no means as common as stars and suns or even as comets and meteorites. They are in fact extremely uncommon. Planets are rare, astronomy says, because they are created only when two stars cross their paths so closely that a conflict of their fields of gravitational force occurs and the mass of a new self-contained whirl of matter is torn out of the bowels of one by the other. Such an event seldom happens. Stars must approach within about three diameters of one another for planetary parturition. But they are generally so far apart in space that even if a star is millions and millions of years old, the chances are still about a hundred thousand to one against its possession of a planet.

As a matter of fact, analysis of the mathematical data involved has recently brought into question the whole theory of such occurrences. Allowing the imagination to run completely wild, no one has been able to suggest a consistent explanation of the solar system in our galaxy, or any similar structure in any other galaxy. In other words, no one has been able to make the available quantitative calculations check with any conception of how a planet like our earth could have originated. Moreover, when a planet has come into existence a number of stipulations must be fulfilled before a life-favorable background can be fabricated on it. The only planet of our solar system where life may have a chance to survive is Mars, which has a twenty-four hour day and seasonal changes resembling those of the earth. But there are a number of factors which make the presence of even the lowest kind of vegetation upon Mars doubtful—specifically the low concentration of oxygen in its atmosphere and the extreme fluctuations in its temperature. Another planet, Venus, has been ruled out as a residence for life because it is constantly bathed in hot steam, which would destroy the hardiest bacteria.

It seems that life can exist upon only a few planets, a relatively infinitesimal fraction of the total mass of the universe. Our planet alone seems to possess the peculiar combination of conditions necessary for its survival. That may be a surprising and perhaps incredible conclusion. Yet it is the one compelled by available testimony. Certainly life cannot be scattered widespread throughout the universe wherever there is matter and energy. Its distribution does not follow the laws of chance. Actually a close scrutiny of

the available evidence discloses a specific pattern, a complex of design, in the sense of an anticipatory adaptation of habitat to life. Such a special anticipatory adaptation implies the functioning of a consciousness determining direction and destination.

Consciousness is implied in the workings of what can be best labeled as psycho-activity. That psycho-activity is cosmic in distribution. For that must be the meaning of the fitness of the physics and chemistry of our earth for life and their accompanying climatic and geologic equilibria. *In their most intimate and minute details, the properties of matter and energy, which are the same throughout the cosmos, are specifically integrated for the production of protoplasm on our earth. Long in advance of its appearance, a unique set of varied conditions favor its emergence*

It is the unique quality of both the surroundings and interior of protoplasm for its history and evolution that should be stressed and realized. These in all their marvelous variety and profusion, and in the balance of stability and instability within themselves, cannot be the outcome of the meaningless collisions of atoms and molecules or their subunits. The physical background and the chemical elements and compounds contributing to life are too conducive to the development and interaction of the living systems we call organisms to be considered indifferent to them. They alone are capable of donating to these organisms an effective responsiveness to the forces of the environment which play upon them.

Chance cannot be summoned to explain these astonishing and illuminating facts and their underlying harmonic patterns. The odds are one against countless millions that the interlocking preparative and assistant properties of carbon, hydrogen and oxygen, and especially their stable compounds, water and carbonic acid, should occur simultaneously as a fortuitous event in the history of the cosmos. Their co-operation cannot be merely the consequence of the law of averages, of causes assisting or cancelling one another to produce a grossly unpredictable result. Rather, we can and must seek the explanation in the workings of the psychic laws of anticipation and adjustment, the law of demand and supply, the law of need and satisfaction, the law of increasing instead of diminishing returns for activity, which are the laws of vital evolution and the laws of creative consciousness.

The singular properties and relationships of the life-favoring elements and their compounds and the remarkable aids to life on the planet which they provide must be taken to be deliberately designed for life and its consciousness and its personality. The continuity of

passage from the most elementary and apparently inchoate units of the universe to the most highly organized systems, continuously evolving into more and more complex states recognized as living, indicate indubitably lines of correlation and configuration between cosmos and consciousness, which can be no passing accident, no by-product of coincidence, no forlorn efflorescence out of ubiquitous dust.

9. CONTINUITY OF ALL CONSCIOUSNESS

The evolution of the universe, the evolution of the solar system, the evolution of the earth, the evolution of life, and the evolution of consciousness form a continuous and integrated series of events. A unique ensemble of interassociation between its members, derivable only from the constitution of the ultimate core of the cosmos, is unfolded in the scientifically reconstructed picture of its history. A preparation and intention for life and the life-personality are inherent in the very heart and origins of the whole. The simplest, most direct, most comprehensive explanation of these facts of cosmic, solar and planetary fitness is that they represent an anticipation of the needs of life such as is implied in the idea of psycho-activity. And as they appeared long before the earth and even the solar system existed, since they can be traced back to the properties and relationships of the special chemical elements which came into being long before them, that psycho-activity preceded them and must be identified with a pre-planetary and presolar cosmic psychation.

That conclusion may sound naively anthropomorphic and so intellectually repellant to a modern mind. Let us not permit ourselves to be intimidated by the words and attitude of those who would reduce the interpretation of these facts to the level of the merely mechanical. Mechanics and science are not identical, even though the law of cause and effect functions universally. If such a psycho-activity, once recognized, could be introduced into an all-embracing mathematical formulation of the universe these inferences would not be at all alien to the mood and method of the modern scientific conscience, nor would they be so open to the assaults of intellectual bigots. Nevertheless, as no such formula is as yet available, the psychic interpretation of the facts is the only one with an appeal to a rational mind and indeed obligatory. A cosmic consciousness inherent in a universal psycho-activity must be postulated to explain the manifest anticipation of the life-personality and the necessities of its adventures long before it emerged. For these life-producing and enhancing powers are

undoubtedly the result of the vital elements. Their properties depend upon the electrons and protons, the neutrons and positrons and photons and quanta, and so on, the final units of matter and energy which compose their atoms. That preparation, therefore, reaches back to the very creation of the ultimates of the cosmos.

If the continuity of substance and memory in living beings demonstrates the existence of a life-personality, the precedent preparation for them of special elements, conditions and integrations permits the inference of a cosmic consciousness. As all the forms of life, taken together, resolve into one greater all-inclusive personality, that personality may be said to be an outgrowth, one and continuous with that of a cosmic psycho-activity. A psychic energy in the cosmos has preceded life, has paved the way for it and has played a fundamental determining role in its history on this earth. If the activities of that psychic energy reach back to its ultimate particles and movements, the rays of a supreme intelligence are seen to pervade matter, energy and life as a single integrated series of ascending organizations driving toward a goal.

It has been an intuitive insight of many minds that a cosmic consciousness exists in the universe. They have considered it inconceivable that merely arbitrary arrangements and rearrangements of atoms or waves would culminate in the creation of those capacities of protoplasm which are least like inanimate matter: awareness, feeling and will. But that attitude has in modern times been driven to a defensive mysticism or a negative agnosticism. It has quailed and shrunk into darkened corners of consciousness before the increasingly confident challenges of those who would rule out altogether its place and importance in life, or belittle it as the mechanical legerdemain of a limited instrument, the human brain. Psychation has been banished out of the realm of respectable causation and has been ostracized as the uninvited stranger in the house of science.

An analysis of the substances and energies involved in the evolution of life in relation to the universe revives that ancient intuition and compels the recognition of its reality with a fresh force and vitality. It now becomes a legitimate induction from the actual, measured facts of verifiable research that there is a universal psychic order in the cosmos. Under its aegis a tremendous number of systems have evolved in cosmic history, varying in magnitude from the most magnificent nebulae, in all their radiant immensity, to the tiniest life cells with their marvelous intricacy. One follows another in a design for the production of the greatest diversity and complexity of systems

that seems to lead in an unbroken continuity to the appearance of man.

In the evolution of the life-personality there is evident an alternation between phases of increasing stability and phases of increasing complexity. A phase of complication, of addition of powers and possibilities, engendering a certain loss of equilibrium, is followed by a period of stabilization during which consciousness appears to gather and concentrate for a new movement of its spiral. All the evidence points to this systole and diastole of the life-personality as somehow connected with the nature and potentialities of the cosmic psycho-activity. Life, as the Son of the Cosmos, intimately partaking of its substance and nature, is so much like it, because it was conceived, nurtured and propelled by it along the lines of a destiny and purpose.

8

THE UNIVERSE AS A PSYCHO-CONTINUUM

THE CONSUMMATE ADEQUACY OF ENVIRONMENT AND THE UNIQUE correlation of physical conditions and chemical constituents in the evolution of the life-personality are sufficient to indicate the presence of a cosmic psycho-activity in the universe. But what is the nature of that psycho-activity? Where is it placed and how is it related to all the other forms of activity in the cosmos including the activity of life which apparently has sprung from it? Is there any way of understanding its workings and following its achievements beyond that of merely admitting their existence and accepting them as ultimate mysteries?

1. SPACE, TIME AND PSYCHO-ACTIVITY

As a multiform unity, the structure and history of life may be envisaged as compounded of the bodies and minds of all the living. Its area of functioning is perceptible upon the crust of the earth, within its hollows, spread out upon its lands and flourishing in its seas. But where are we to look for the cosmic structure that must be postulated behind these manifestations of a universal psychic process? Human thought requires a certain intelligibility in its beliefs. It demands that consciousness function in an organization, persist in an environment, possess a memory and face a future. In other words, a cosmic psychation must have its being in time, space and history for a human mind to comprehend it at all, or even to admit its reality. There is no intellectual satisfaction in identifying it with the One who is Everything and the Everything that is One, the pantheism of oriental mystics. Such verbalism is merely an evasion of the quest. On the basis of overwhelming evidence we accept the fact that on earth consciousness is associated with and activated by protoplasmic matter. Wherever we find psychation, we find it incarnate in flesh and blood, or their equivalent. But how shall we conceive the body of cosmic psycho-activity?

A cosmic psychation would have to be a pre-protoplasmic conscious-

ness, since it preceded protoplasm in time, and of necessity could have none of its physical, chemical or biological qualities. Yet it would have some of the psychic characteristics that are displayed in protoplasm, since these present progressive adaptations and complications of the same continuous underlying activity that stretches from the beginning of the universe. How are we to reconcile our human notions of substance and form, extent and duration, as they are applicable to the known living entities of concrete experience, with a cosmic predecessor? Men have learned to accept as realities entities inconceivable as immediates of the senses—such as atoms and electrons, light and radio waves, astronomical magnitudes and electromagnetism. Perhaps there is a similar way of conceiving cosmic psycho-activity as a reality. Like them it must be considered in terms of its effects. For it, too, functions as a form of energy, and, like these other invisibles, is known only by its effects.

2. THE ORGAN OF SPACE SENSE

Human consciousness normally conceives reality in three dimensions of space and three aspects of time. Human consciousness is distinguished from animal consciousness by its awareness of these divisions of space and time as panels of reference for its perceptions. Human intellect has abstracted the feeling of space as a co-ordination of the three dimensions of length, breadth and depth and the feeling of the flow of time into a concept of a continuous duration composed of the three aspects of past, present and future. Man and his animal predecessors possess this spatial consciousness primarily limited to the three dimensions because they obtain their information about space through a physiological mechanism they have biologically inherited. Their perceptions of dimensions are conditioned completely by this mechanism. If they had another kind of internal mechanism, their space perceptions could be quite different from what they actually are.

Perception of space is fundamentally dependent upon the biological function of equilibration. The instrument evolved for this regulation is that curious construction inside the ear, known as the semicircular canals of the labyrinth. The semicircular canals within the ears consist of a set of tubes arranged in almost complete circles in three planes approximately at right angles to one another. Within them is the endolymph, a fluid whose movements register the position of the head in the ordinarily perceived dimensions of space. They are, in effect, three water levels that measure displacements of the body

in the gravitational field around it. There is a direct parallelism between these anatomical representatives of the three dimensions, and the terms and figures represented in the three planes of geometry included in the classic space of Euclid.

These semicircular canals are the space meters of the body. They have become most intimately associated with the sense of hearing because of the compulsion to adapt the body movements to one side or the other, in its planes of orientation, to adjacent vibrations directly felt or translated into sounds. Even if man ever grew a larger brain, he would always be limited by his sense organ of space to the three original dimensions in his immediate sensations of space. With a larger brain, however, he might easily re-educate his perceptions in accordance with his conceptions of the real, as has happened in the case of the eye, which presents incomplete pictures to the brain that are corrected by it and re-projected as such into its physico-reality.

Not that the labyrinth is alone the carrier of the sensations of space variations. The muscles with their contact sensations and the eyes with their recordings of distance and perspective contribute essentially to the sophisticated space reactions of the advanced vertebrate. But fundamentally, our ideas of space have grown out of this prime necessity of behavior in our animal ancestors: the making of balancing and adjusting movements, movements of offense and defense, movements of approach, of attraction and aversion, movements of equilibration in a fluid medium. The smallest number of dimensions—planes of reference—for these movements would be selected in accordance with the general laws of economics of energy in protoplasm. And these have been worked out to be three, as the embryological and evolutionary history of these semicircular canals of the inner ear reveals.

The organs which have determined our conception of space are constructed to convey useful information concerning the immediately adjacent environment only and not any knowledge of space as a whole. At the end of each of the semicircular canals is a slight swelling, the ampulla, which in turn leads into a baglike structure, the vestibule. Within each ampulla is present the actual protoplasmic registers of the sense of space. Each contains a patch of cells with long hair-like processes dipping into the fluid of each canal. When the head is moved in any one plane, say forward or down, there is a disturbance of the water level in that canal. A slight current is set up in the fluid of the canal of the particular plane involved and this bends the delicate hairs of the corresponding ampulla. A message is dispatched to the brain from these cells regarding the vibrations sweep-

ing over them. The individual becomes informed that there has been a horizontal or vertical or lateral movement of the head. Then there may be movement of the body as a whole in the three dimensions of space affecting the flow of the fluid in all three of the canals causing a stimulation of the sense cells in all three ampullas. A comparison of the intensity of disturbance in one, as compared with the others, results in a total judgment of the direction and consummation of the movement.

It is not a feeling of absolute movement, but a feeling of relative *change* of movement or direction that is estimated. Up or down, forward or backward, right or left—these the canals register. In effect, these organs of perception have been evolved as instruments of adjustment of the organism or its frontal projections to the proportions of possible positions in the gravitational field. For they function only in the perception of movement, not of any constant, uniform motion, but of accelerations or slackening. The dynamic mechanism of the apparatus can test such variations of space only through disturbances of its own inertia. In this sense, then, the perception of space is physiologically innate in that the placing of all the experience of physico-reality in the three dimensions is an organismal performance, based upon a specific biological organ. It has no necessary relation to the actual number of configuration of the total dimensions or planes of measurement of the medium in which the living function. All one is entitled to say is that there must be at least three of them, although there could be many more.

The psychic reception of a space of three dimensions is therefore as much conditioned by the activity of these labyrinthine organs of the ear, as perceptions of color are dependent upon the rods and cones of the retina of the eye. It is well-known that the retina is sensitive only to a circumscribed series of vibrations of light, the spectrum of red, yellow, green, blue and violet, although a continuous range of other, longer and shorter, vibrations exists on either side of the color series, the infrared and the ultraviolet. A variety of such vibratory realities—sometimes called the black colors of the infrared and the ultraviolet—which are not directly accessible to our organ of vision, have been demonstrated and measured.

Numerous other dimensions of the spectrum of the human space scale may likewise be conceived and remain to be looked for and explored. No limit to the number of dimensions, besides the three directly recorded by our organs of space perception, need be conceded. It may be that the biological apparatus of equilibration is not im-

mediately applicable to them and that is why they have hitherto escaped detection by the senses. And as a matter of fact, an extensive series of such extraphysiological spatial dimensions can be imagined and have been mathematically studied. Such dimensions might be called the ultrahuman dimensions of reality. Their reality could be proved only by means of a special extra-sensory approach. By the invention of new organs—instruments—involving a nonconventional manipulation of concrete objects in space, and by a logical analysis of the resulting data, they too, might be shown to be as real as infra-red rays or ultraviolet rays.

Methods and apparatus—really new organs of vision, or what might be called organoids—have been discovered to extend the range of our knowledge of color vibrations, in spite of the limitations of our eyes. Similar methods might be employed in extending the range of the dimensions of space, in spite of the evident limitations imposed by the structure of the semicircular canals. By escaping from the boundaries set by the animal senses of touch, vision and equilibration, we might come nearer to the structural heart of the real and true world and understand better its impregnation with psycho-activity.

3. THE FUNCTIONING OF THE TIME SENSE

Similar considerations might and do hold for the aspects of time and the functioning of the time sense. There is a definite biological background for perception of time. Every tissue is its own time-keeper and measures time in terms of its own activities. The tide and flux of metabolism in the skin cells, the muscle cells, the bone cells, the visceral cells, even the nerve cells, determines for them what shall be considered the unit or pulse of duration and the interval between. It is characteristic of differently constituted cells to take their own time in reacting to stimuli. In other words, they measure their reactions to stimulation with their own particular internal clocks. Every tissue reacts in units of a time interval, specific and constant for it. There appear to be quanta of time, just as there are quanta of energy in the release of activity by the cells. Each tissue observes its own changes from its own point of view. This might be called the physiological or biological time of the organism.

Time and metabolism in organisms are interrelated in certain curious but definite proportions. Metabolism determines the rate of the passage of physiological time and gives an exactness to the cells' own perception of time. Time for them is dependent upon their rate of activity. Each tissue thus measures time with its own metabolic chro-

nometer which fixes the unit of its speed of reaction to stimulation. And this chronometer may be essentially electrical in nature because electricity is a by-product of all cell activity.

This self-determination of time in tissues is fundamental for our understanding of the physiological conditions of the time sense. The variable timings of the different tissues and cells form a pattern which confers upon consciousness, through the brain, the strange constancy and continuity of its sense of duration, derived from sub-conscious sensations of these other components of the body. The cells of the brain also possess a timing of their own for they have periodic electrical pulsations. These fuse with the brain's own sub-conscious perception of the activities of two incessantly pulsing muscles—the heart and the diaphragm—of breathing and circulation of oxygen, which are the immediate and absolute prerequisites for the continuance of life. The unconscious timing of the brain, its realization of the incessant flux of time, is therefore the result of an unconscious listening to the reports of its physiological accompaniments. Such perception of time is projected into the environment as the sense of the duration of the body, the organism, the self as a whole.

4. THE PHYSIOLOGICAL SPACE-TIME CONTINUUM

Now it is also most interesting that the keenest perception and measurement of time, which occurs in hearing or listening, is mediated primarily by another organ of the internal ear, the cochlea, located next to the semicircular canals. It is during audition that the most objective experience of the passing of time takes place. The sense of actual duration in a physico-reality is thus most closely and intimately connected with its sensations of space. The two flow together in the rhythms of events occurring concomitantly with the succession of their activities. A basis for a sense of space-time is made.

Just as the color sense and the form sense fuse constantly in a simple visual perception, the sense of time and the sense of space organically coalesce. It is as if time and space were originally sensed together and simultaneously, but have been separated and analyzed apart by the human brain for purposes of abstraction. But their separation is an artifact, an artificial division of what is a unity and an identity, physiologically, at any rate. The anatomical proximity of the organs of space and time is associated with a physiological fusion of their functions. These facts account for the existence of a unity

of perception of space-time, when the mind is left innocent of abstractions.

As the organism first perceives them, space and time are physiologically a continuum. The impingement upon consciousness of successive intervals of sensation, such as occur most definitely in hearing, contribute to the feeling of the lapse of time. But this is always conjoined with the sense of movement in space. Space-time are what the tissues begin with, their primary reactions are to space-time. The separation of space and time has been accomplished by the analytical necessities of the intellect. There is a physiological basis for the concept of a continuum of space-time, of what might be called the physiological space-time continuum.

Human sense of space, and human sense of time, are basically sensations, like those of touch or vision. Their validity can and should be expected to be only of the order of sensory transformations of the energy of the physico-reality from which they are derived. They are psychic filtrates or translations of their original physical and chemical sources. As physiologically conditioned perceptions, compounded out of nerve-originated sensations, they cannot be and are not absolutes.

Space experience and time experience, originally simultaneously united and one in the body, resemble one another, mimic one another, and may be substituted for one another in many ways. We say that something is before us or behind us as regards both space and time, that a certain consummation is nearer in time, and we look forward to an event as if to its attainment in space. These are not merely metaphorical transfers of language, but essentially articulations of the organism which feels they are correct because they are derived from the same fundamental sources, the similarity and proximity of the functioning tissues involved. Their fusion as a continuum in our animal organs suggests that space and time as the human mind separates them are intellectual artifacts engendered by the abstracting necessities of our particular psycho-activity.

5. SPACE, TIME AND SCIENCE

Space and time are the inevitable framework of the objective world for any consciousness. Therefore a cosmic psycho-activity would have to assume a location within the ground plan of space and time as surely as a human consciousness would have to live within it. Such would be the demand of one who would place cosmic psychation in any structural map of the cosmos that is consistent with the logic of physico-reality.

The cleavage of time and space has introduced a far-reaching splitting of reality. Such a splitting was strengthened by the methods of their measurements by means of the instruments calibrated in the conventional units introduced by science and invention. Certain supreme intellectual achievements, the geometry of Euclid and the mathematical mechanics of Newton have reinforced these distinctions of time and space as self-contained realities and made them seem eternal truths. Geometry began as measurement of land and lends itself easily to tridimensional description, because life has had to adapt itself perforce to the surface of the earth as well as to its center of gravity. Newton generalized the measurements and observations of earth and sky, based upon predilections of human consciousness, into a far-flung astronomical system by a series of equations which worked well enough for their purposes and data. Indeed, for several centuries it was considered as settled that his mathematics and mechanics had hallowed the three dimensions of space and the independent flux of time into imperishable and invulnerable fundamentals of science.

But there were certain thinkers who were never quite satisfied with that sanctification. From the very first appearance of mathematical conceptions of space and time as such among the Chaldeans, Egyptians and Greeks, certain paradoxes and contradictions were noted and discussed. More recent probings into the relations of exceedingly small quantities of space and time as contrasted with overwhelmingly large quantities have renewed and fortified those doubts. Attempts to remove such doubts and discrepancies have led to a revision of these fundamental concepts of the universe to make them more consistent with the physiological intuition of space and time as one integrated whole, best designatable as space-time. Time and space have again been restored to the primary indissoluble partnership of the intimacy of their sense organs, that is to say, the organs which react to changes in their environs, and register them as movements within their protoplasm.

For a time the mathematicians and the physicists, as well as the metaphysicians and the astronomers, combined to abandon the physiological foundations of time-space. They succeeded in conceiving an ultrahuman kind of space, something altogether different from what is experienced by the human consciousness. That achievement they could not entirely duplicate in their conception of time. A residue of relationship with movement and hence with space could not quite be sublimed out. But their criteria of an objective reality, the placement of its objects in a scheme of space independent of time, became

accepted by all with any pretense to intellectual respectability. Abstracted from time, space in itself, as the container of the real, as the background of the real, as the very pattern of the real, came to be taken for granted by those men of science who came after Newton. They employed it according to their necessities for the problems of mathematics and mechanics, of physics and astronomy that had to be solved. For long there was no need for a correction of their assumptions. Then two problems, the problem of the transmission of light, one of the most obvious and yet most inexplicable of the everyday phenomena of the physical world, and the problem of parallel lines, one of the most obvious and unprovable of the mathematical world, served to focus attention upon the need for settlement of the precise status of space and time in all thinking that involved them as abstractions. That inquiry finally led to the reconstruction of the whole intellectual and scientific model of the universe. In the end, the idea of three dimensions of space existing independent of time, had to be discarded. By a long and roundabout path of logical analysis, criticism and revision, the immutable union of space and time grounded in their physiological contiguity and cofunctioning has been restored to its primeval position as the true matrix of reality.

Like the ten scriptural commandments of behavior, the first ten axioms of Euclid were for long believed to be the elementary unquestionables of thought. Their propositions constituted the indubitable *terra firma* of intelligence. There is an eleventh axiom, though, which says that parallel lines can never meet. It was accepted and swallowed more like a medicine than because of any intuitive attraction. Euclid himself, never stated this rule of parallel lines as an axiom, but as a postulate, as a necessary assumption rather than as a self-evident truth. Newton and the mathematical physicists who came after Newton never challenged it and found that it worked perfectly for their purposes. And as all their facts and theories fitted into the geometry of Euclid, no doubt of its validity was ever seriously entertained.

The intellectual conscience of the mathematicians, however, never was quite easy about the so-called axiom of the parallel lines. It was felt that if it must be true, there ought to be a more elegant, a more immediately compulsive way of stating its self-evidentness. Over a period of about a thousand years, there were a number of attempts to deduce that axiom from the preceding axioms as a guarantee of its logical perfection. None of them succeeded, not even the most

valiant, essayed in the eighteenth century by Sachieri, an able Italian geometer, who attempted to prove it by assuming that it was not true and showing what contradictions and absurdities that assumption produced. He failed, although he refused to recognize what his failure had proven—that it was not necessary to acquiesce in the conclusions of the axiom and, therefore, not necessary to acquiesce in the whole of Euclid's geometry.

About a hundred years later, in the first years of the nineteenth century a Russian, Lobachevsky, and a Hungarian, Bolyai, boldly asked themselves the consequences of denying the axiom, and created novel, revolutionary but self-consistent geometries, which came to be known as non-Euclidean geometry. Then a German, Riemann, constructed an altogether original and complete non-Euclidean geometry. An indefinite number of such geometries may be imagined and speculated upon, it is now conceded. These non-Euclidean geometries are tremendous feats of imagination, violating, all the predispositions of the senses and common sense against them.

It was the story of Copernicus and Galileo over again. Earth moved and not the sun, though the eyes and the judgment of the eyes saw the opposite as self-evident. Another mathematician, Beltrami, demonstrated the real difference between Euclidean geometry and the non-Euclidean theories by showing that the latter were the geometries of the shortest lines drawn on curved surfaces, while in the old classic geometry everything really occurred and could only occur on a plane surface. On the surface of a sphere, for instance, the meridian lines, circles drawn between its poles, are parallel and yet they meet at the poles. To a person moving on a surface of such a globe, but unaware that it is a sphere, these meridian lines seem perfectly straight, and would never meet, no matter how indefinitely prolonged. He would conclude, too, that they would make right angles with the equator of the sphere, which would prove them to him to be incontrovertibly parallel. He could go on and construct a Euclidean geometry, with its axiom of the non-meeting of parallel lines, and regard it as absolute truth—until his intelligence and his imagination escaped from the fettering deceptions of the naive sense organs as man has escaped from the illusion that the earth is flat.

The successful attack upon the validity of the eleventh axiom paved the way for a revaluation of all the axioms as well as the theories of Euclid. A contemporary of these pioneering mathematicians, Carl Friedrich Gauss, worked out a new approach to the study of curved surfaces and discovered the fundamental principles of two-dimensional

geometry of which Euclidean plane geometry is a special case. Thus he came to doubt whether the geometry of experimental physics, with its assumptions about space, was Euclidean or otherwise. Along the lines of his doubts, he made an experimental test of the theorem that the sum of the angles of a triangle is equal to two right angles. Rays of light passing between mountain peaks formed the sides of his triangle. He failed to find a difference in his measurements from that provided by the Euclidean theorem because the gravitational field of the earth is too small to demonstrate the curvature of the lines along which light travels. Nevertheless, mathematicians came to look upon the axioms and theorems of Euclid as not necessities but as conventions and agreements of thought.

The ancient science of geometry which was originally born out of the practical needs of the agricultural surveyors of Egypt to preserve the measurements of their flatlands, that were flooded annually by the Nile, was liberated from the limitations of human experience by more abstract thinkers. Any number of geometries may be invented to deal with the space of the world, with physico-reality as translated into psycho-reality. They may be based upon axioms or assumptions consistent among themselves, yet each system may contradict another. Geometry is a branch of abstract logic, a system of related definitions and propositions, premises and conclusions manipulated by our common psycho-activity. All its activity and products turn completely upon the nature and qualifications of what it begins with. Its deductions and inductions have only to form a system which is criticism-proof i. e. it can bear the logical consequences of the original assumptions.

6. LIGHT AS THE UNIVERSAL COHERER

With these revaluations, the whole problem of understanding the location of entities or systems in time and space takes on fresh aspects. If any number of geometries are logically possible, any number of universes are logically possible. The one best fitted to portray the observable universe could be determined by its power to incorporate in its pattern the maximum of observations concerning its contents, properties, changes and history. These observations would certainly have to include the activities of a cosmically distributed psychation. Such a psycho-activity is manifested, not only in the data of preparation for life elicited by a comparative study of the physics, chemistry and astronomy of the earth and solar system, but also in a number

of phenomena which can be subsumed in the existence of a psycho-continuum.

An intellectually acceptable and respectable conception of a cosmic psycho-activity would in the past have had to square with the picture of the universe that Newton built upon the Euclidean geometry. Considering its all-too-human contradictions and limitations, this would have been impossible. Alternative geometries and alternative world pictures have become available and intelligence ceases to be oppressed by a feeling of absurdity latent in any attempt at a consistent reconciliation of the laws of an all-pervading psychation, with the incongruities and impossibilities of a tridimensional world in which objects are spatially separated, as well as distinct in time. These new geometries with their different models of a unified cosmos have rendered it conceivable that such a psycho-activity could be at least imagined as distributed in some other way than that inherent in creatures that could conceive only of their own three dimensions as real. No longer is it necessary to look askance upon any image of the cosmos not localizable in the framework of the traditional dimensions as irrational fantasy.

From another direction, the experimental study of the different forms of energy—the energy of gravitation, the energy of electricity and magnetism, the energy of light—came new information that forced another revision of the three-dimensional concept of space. These revisions were necessary because the activity of such energies (and it is only their activities that can be observed and studied) is always involved with time, and all movement involves the relation of time and space. As quantitative details accumulated and the logical analysis of them proceeded, it became evident that the traditional separation of time and space introduced logical difficulties into their understanding that could not be overlooked. For they obliged the acceptance of impossible hypotheses and most contradictory speculations. Such antagonisms of experiment and logic could not long be permitted to persist, so another revolution in thought followed.

When Newton's *Mathematical Principles of Natural Philosophy* was published in 1627 with its statement of the law of universal gravitation, a persisting problem was formulated: that of how to conceive a force exerting its action at a distance—how that which was not in contact is brought into contact. The law of universal gravitation stated that any two bodies attracted one another with a force, that is, a pull, inversely proportionate to the square of the distance between them. It was essentially a formula for stating mathematically

the movements of the bodies of the heavens as observable and predictable from their masses and positions in space. The nature of gravitational attraction remained a mystery, as Newton himself emphasized. Some medium for it had to exist, some way of establishing contact between the bodies involved and the force emanating from them.

Research upon the properties of light suggested the nature of that medium. In 1690, the Dutch physicist, Huygens, proposed the hypothesis that light consisted of waves or vibrations in a universal medium, the ether. He was opposed by Newton with a theory that light consisted of corpuscles, passing in all directions from luminous bodies. Facts of a developing experimental science gained the victory for the hypothesis of an ether traversed by vibrations, because numerous observations, showing that light could be reflected and refracted, in ways perfectly analogous to water or sound waves, turned the balance in favor of a conception which explained these phenomena.

During the nineteenth century, the accumulative discoveries of Young and Faraday and their mathematical formulation by James Clerk Maxwell gradually established the theory of a vibrating ether, in which waves of light moved about freely, as the foundation of physics, which meant of all science. Electricity and light were shown to be parallel movements of an identical nature. While the theory of vibrations could not be made to include the facts of gravitation, the other great energies, heat and light, electricity and magnetism, were all embraced in a system of waves of differing frequencies in this ether, co-ordinated with space and time. Astounding practical applications of the theory—such as the invention of radio transmission of sound—came as direct deductions from mathematical calculations concerning that spectrum. It was hoped and expected that all of the manifestations of matter and energy and even life and thought would someday be explained in the terms and imageries of the properties of this fundamental of fundamentals, the ether.

7. EXORCISM OF THE ETHER

Nevertheless there remained a certain obstinate mysteriousness about this ubiquitous ether. There were time and the three dimensions of space, both comprehensible. There were matter and energy, both comprehensible, that is conceivable. But the ether was ultimately incomprehensible, because it was not consistently conceivable. Most curious and contradictory properties came to be attached to it.

Indeed, it reminded one of the curious conglomerations of characteristics compounded by the medieval scholastics for angels and devils. The ether was ubiquitous, pervading all of space, actually constituting space, but another name for space. It was continuous even within the bodies of atoms as well as between them. It was perfectly elastic and yet perfectly rigid. It was so rarified and so permeable, that masses traversed it without encountering resistance or losing energy through friction. At the same time, it was said to be a billion times denser than water.

It seemed necessary to test the existence of this most remarkable substance, to learn whether it was real or merely a fantastic product of human thought. In 1887, two American physicists, Michelson and Morley carried out a classic series of experiments designed to establish, by some definite tests, the presence or absence, the reality or unreality, of this ethereal ghost behind space. Instruments were fixed upon a stone slab attached to a wooden float, suspended in a mercury tank. The float could revolve in the mercury and complete a revolution in six minutes. There were mirrors on the float so placed that a ray of light striking them was broken into two parts. As a result of this splitting, one half of the light continued moving from east to west—as the earth moved—and the other was reflected so as to move from north to south—at right angles to the earth's flux.

If the earth were moving through any fixed ether, it should follow that the east-west ray would register the completion of its journey sooner than the north-south ray. The testing apparatus was thus specially devised to measure the difference in racing time of the two crossed rays of light. If the ether was real, as a medium ubiquitous but stationary, the light speeding through it should be retarded in its movement measurably, in at least one direction. But no difference in time at all was found under the most diverse conditions. Nor was any other condition found capable of making any difference whatsoever in the resultant figures for the velocity of light. It remained the same as those previously ascertained under much cruder experimental observations. If there was an ether, it could only be concluded that the earth dragged it along, as it revolved around the sun. But then it could not be conceived as stationary.

Either there was no ether, or relative motion between matter and ether could not be detected. That was the logical conclusion to be drawn from these experiments. The physicists, however, refused for a long time to discard the notion of the ether. One of the greatest of mathematical physicists, Lorentz, struggled brilliantly to save the

concept by arguing that matter at the tremendously high speed of light—186,000 miles per second—must contract in its dimensions. If the contraction occurred in the matter of the Michelson-Morley apparatus, which moved with the earth, the rate of the consequent shortening might effect the expected change in the velocity of light. A moving rod would thus be somewhat shorter than when it was at rest. But at the same time it was necessary to assume that the time elapsing between the two events measured by a moving rod, is longer than when the rod is at rest, a new paradox. As a result of these experiments with light, a number of such serious difficulties have appeared, which rendered the ether concept the chief enigma of the material world. But now a genius resolved the enigma of the ether into a pseudo-problem and a pseudo-concept.

8. CONCEPTUAL SPACE-TIME

It was Albert Einstein who worked out a way of dealing with the medium whose role was to reconcile the conceptual independence of time and space. Instead of forcing the new facts into the old molds, he submitted all the work heretofore done on the subject of ether to a logical analysis of the effects of movement itself upon measurements of time and space used to record that movement.

Einstein began with the original notion that it is logically impossible to determine the absolute motion of anything by any experiment of physics or astronomy. Examining, from this point of view, the phenomenon of the transmission of a ray of light through space, he proved that its speed would be independent of the speed of the observer who might be measuring it. Consequently, observers in uniform motion with respect to one another, as physicists and astronomers necessarily are, will always find, when they are employing instruments to determine the speed of light, that the velocity of light remains the same for all of them. In other words, the units of measurement of space and time are relative, conditioned by the observer's own motion as well as by that which is observed to move and must always remain relative to each other. Therefore it becomes no longer possible to think or measure a separate absolute time or a separate absolute space. A time and a space, separate in themselves but constant and the same for all observers throughout the universe, do not exist.

So men of science were driven to realize the necessity of having time and space co-ordinated and fused as a system of four dimensions. For all phenomena the measurement of time is incomplete without a concomitant value of space and vice versa. They have indeed to be

considered equivalent dimensions of the reality being measured. There is always a coverage of space and a lapse of time between any two events occurring in the universe. Hitherto the mathematicians of space had not considered it necessary to calculate the time it takes to make their measurements. A distance covered between two points on a line was considered a phenomenon of a single dimension, movement between two lines on a plane took place in two dimensions, while the motion in a solid was in three dimensions. But time was nonexistent, so far as these dimensions were concerned. The new questions about the ether, and measurements of its movements indicated that time and space would always have to be correlated in any dynamic picture of the cosmos.

Another mathematician, Minkowski, thinking independently, suggested that if the time lapse of any three-dimensional event would be regarded as just another distance or dimension, then a co-ordinated four-dimensional system was evolved, space-time, describable in absolute units of measurements. These space-time units would be intervals which would be the same for all observers, no matter where they were, measuring the space separating two events or the time intervening between them. Different observers might disagree because of lack of accordance of their time units with their space units, but if they all measured in terms of space-time, they would find themselves in complete agreement regarding their findings, since they would be taking into consideration the pertinent variations in the units upon which their measurement depended.

If the universe were a four-dimensional continuum, then the relative spaces and times of different observers are nothing more than cross-sections of it, taken at different angles. Because of different motions of the observers themselves, their observations would be broken up into different space and time components, different blocks of space-time. The paradoxes and contradictions of different viewpoints are thus resolved. A four-dimensional continuum necessitates the use of a four-dimensional geometry. Here again the velocity of light provided a coercive reason for the acceptance of such a geometry. In the three-dimensional geometry of Euclid, the geometry of parallel lines that never met, there was no limit to the velocity of light. But in a four-dimensional continuum, its ultimate velocity must be conceived as finite, constant and unalterable.

In such a system, moreover, the interconvertibility of matter and energy becomes demonstrable because the mass of a body increases with its velocity. In virtue of its increased energy of movement, its

concentration of matter increases. The relation of mass to weight and of weight to energy in the continuum makes it possible to show that moving energy has the momentum of moving mass. Quite consistently with this conclusion, it has been proved that light has weight. Light exerts pressure on any body on which it falls, because of its momentum. A cooling body, or a body emitting light, loses mass. A material particle, therefore, can be defined as an extremely condensed localization of energy. To the correlation of space-time may be added that of matter-energy, for they now turn out to be different forms of the same underlying unity.

9. THE COSMOS AS AN ORGANISM

It was light, and it was fitting that it was light, that led the way to this new vision of the universe. Light, the holder and conveyer of all secrets, revealed that cosmic reality was not a mere mosaic chaos of separable constituents held together by an arbitrary patchwork of mechanical laws, but a unified structure, an organic continuum constructed with a most tightly knit internal organization. And when in the twentieth century light gave that supreme revelation to mankind, the dissociative enigmas and antinomies of the past were replaced by a conceptual model of the cosmos that possesses at once the geometric design of a unified reality and the endless plasticity of a world organism.

A new identity of the heavens and the earth is unveiled. As Minkowski put it: "From henceforth, space in itself and time in itself sink into mere shadows, and only a kind of union of the two preserves an independent existence." To this may be added what another great mathematical physicist, Weyl, has said of this space-time union or continuum: "If it is not a god, it is certainly a super-human giant." Now fresh horizons and undreamed of vistas open before the enlightened eyes of mankind, for space must be identified with matter and time with space, and energy with all of them. That organic continuum of the world is seen to contain a unified entity that possesses a texture and an anatomy, a fabric and an architecture, a dynamic and a fate dependent upon a single organization.

Only in terms of ultrahuman dimensions can the universe be adequately measured and comprehended. Einstein has envisaged the cosmic system as a mollusk, expansile and contractile like a living thing. In so far as such a four-dimensional mollusk is capable of systole and diastole, differentiation and heterogeneity, it becomes logically legitimate to realize the cosmos as a unified system. A unified

system that is self-sustaining and self-regulating is an organism. If it is possible to conceive that the cosmic system is imbued with a universal psychic energy, the cosmic psycho-activity out of which the life-personality has been derived, then the universe is an organism. For it must inevitably be postulated that the integrated space-time continuum is the medium for the cosmic consciousness that prepared the way for life.

Space-time, matter-energy, cosmos-life are concordant aspects of the same underlying entity. Under the old dispensations of a separate time and a separate space, a separate matter and a separate energy, a separate body and a separate mind, no such identification was possible. Now a rational habitat is at hand for the placement of the necessary psychic dimension of the cosmos. The replacement of the ancient discontinuities of the universe by such a continuum as an integrated amalgamation of all known qualities of substance and action in a single cosmic field makes possible the addition to it of a universal psycho-activity.

Not that any claim may be made for any final understanding of the nature and activities of the universe. That there is an electromagnetic wave range, embracing the activities and properties of its smallest particles and units of matter and energy, seems pretty well established. That there is a similar gravitational gradient has been suggested for the grosser movements and laws of behavior of the larger aggregations and groups of these. That there is an accompanying pressure of psycho-activity, organizing and directing the others along the lines producing the greatest combinations of complexity and stability is only a necessary completion of the series of agents operating within that all-embracing continuum.

10. FROM THE ENERGY-FIELD TO THE UNIVERSAL CONTINUUM

Space-time, with its ultra-Euclidean geometry, introduced a new framework of the universe. Its curves are transfused with light, while an undertow of two great forces struggles for its possession—one force contracting it with gravitational power, and one expanding it. So much has been learned from the intensive scrutiny of the optical manifestations and the careful analysis of the inertias of its vast masses. The total picture however, would remain static if it were not for the curious properties of electromagnetic phenomena.

The idea of a field of force—in which objects not in direct contact influence one another as if they were in direct contact—is a wholly modern conception of physics. It substitutes for the passive emptiness

of space as a chasm of nothingness, a vibrant medium of activity with bridges which can bind everything with everything. Space-time can now accomplish connections because it has acquired two new qualities: structure and energy. The structure is a pattern of waves carrying vibratory energy and moving with the speed of light. Both electromagnetic waves and light waves constitute the radiation which make of the continuum the medium by which voices and pictures may be transmitted all the way around the earth. And the invisible wires by which universal space-time is transformed into the universal continuum transmit the same radiation which permits us to see the stars and the galaxies stretching into the farthest reaches of the cosmos. Every microphone and every antenna is now a witness to the fact that space and time together conform to the design of a universally distributed energy confined within a cosmic organization.

Space and time are properties of that largest field of energy activity which may be called the continuum. Space and time have become the positive, buoyant components of an organic universe. Insight into this continuum, incorporating time, space, matter and energy, was a tremendous feat of the scientific imagination, for it removed a number of incoherences from the model of the cosmos that had been taken for granted for many centuries, indeed millennia, because of ancient prejudices and old assumptions. To get away from conceptions of isolated fragments of space and particulate divisions of time and localized charges of electricity was an event of the greatest significance in the growth of understanding of physico-reality. It was achieved only through the realization that the essential activity transpiring in associations of time and space was that of a unified structure.

Like every other concept of science there is certainly nothing final or absolute, finished or perfect, about the continuum concept. It is subject to many criticisms and revisions and doubtless will be subjected to many more as time goes on. Even now it does not reconcile or include in its scope many facts and possibilities. But there can be no question that the human intellect has jettisoned forever the dimensional schisms which arose from its conceptual adaptations and has achieved a new perception of the structural unity of a universe impregnated with energy, including the psychic.

11. HINTON AND THE FOURTH DIMENSION

A year before Einstein's first paper appeared, an English mathematician, Hinton, published a book on the fourth dimension. It also concerned itself with the conception of a four-dimensional continuum.

A review of its theme may perhaps serve to show the trend toward the future development of a form of consciousness to which such a continuum will not be merely conceptual, but again perceptual and physiological.

The idea of the fourth dimension has a strangeness about it that makes it very difficult for the everyday mind to assimilate. But to Hinton the fourth dimension was as objectively real as any of the other dimensions. In particular, he was impressed with the need for actual models for its representation and visualization. Employing such models as he himself invented, he stressed over and over again the necessity of eliminating personal twists of behavior and the limitations of the individual ego. The reactions of up or down, right or left, backwards or forwards, prototypes of self-interest, he admitted to be valuable in the immediate interest of survival, but a supreme handicap for the comprehension of the greater realities.

For the perception of the ultrahuman dimensions of the universe, it is necessary to escape localized and individualized barriers of awareness and psychation. An attitude of contemplation, akin to the attitude by which a work of art is assimilated, is requisite. Hinton's reasoning constitutes an original and profound contribution to that visualization of the continuum which will free us from our bondage to the traditional three-dimensional world and its limitations.

Modern man has achieved a real conceptual dominance over his sensations, and thereby escaped from the prison of his animal origins. He constructs his pictures of physico-reality by means of ideas, the concepts which constitute the nuclear contents of his psycho-reality. Hinton, however, exhorted the human imagination not to be satisfied with a merely verbal acquaintance with the fourth dimension, or a simply intellectual realization of its existence. He was convinced that a method could be invented by which it could be presented to the eyes as concretely real. Not resting content with a purely mathematical or logical delineation of its characteristics, he strove to produce the feeling of reality about it as something seen, to materialize it, as it were. A re-education of the sense organs was necessary to bring about that kind of transformation.

Hinton worked out sets of exercises to visualize the fourth dimension in a series of lessons, which consisted of manipulating groups of differently colored cubes. These were to be looked at and mentally photographed, first in one position, then in another, in a whole series of positions. The first exercises involved the use of a cube comprising twenty-seven smaller cubes, each colored differently and differently

named. After that cube was mastered so that it could be precisely recalled to memory, it was turned upside down and had to be learned and memorized all over again. Then the various smaller cubes were moved about, and the cube so formed had to be studied again until it became thoroughly familiar. The largest multiple cube was called the tesseract. To see it as a whole in a simple flash of perception is to see space and time integrated, as a physiological perception.

As a result of diligent practice with the tesseract, Hinton claimed, for himself at any rate, the ability to see the fourth dimension. It was the effect, he contended, of abandoning the constantly active self-interest of ordinary, everyday perception. A new kind of consciousness of space is thus achieved, immune to the immediate needs of the ego, which must always know where it is as regards its own safety, orientation and equilibrium. Hinton's method is the most competent yet discovered to promote the direct perception of the continuum. Limited as it is, it points out the approach to the development of a higher consciousness, as different from our human consciousness as that differs from the animal.

Now we know that there is no incurable finality about the limitations of our perceptions and more especially those of the eyes. They may be trained to experience the fourth dimension—the ultrahuman dimension—by accustoming them to take in objects as a whole and from all sides at the same time as they would be seen in that dimension. Once this is accomplished in the visual imagination, the transfer to an actual retinal grasping of it becomes possible. Eyes may be educated to a new space sense by a systematic and thoroughly carried out practice of the tesseract exercises. Human beings may thus in time be liberated from the personalized conditions of their psychic activity and grow a new consciousness. Hinton's cubes represent the crude beginnings of a transfiguring technique of perception for which a space and time and a cosmos of higher dimensions—beyond those of the metronomes and water levels in our ears and brains—would finally become natural and unquestionable, not only logically and analogically, but directly, sensuously. It would appear as normal to them as the position of the earth in relation to the sun in a planetarium seems to a present-day astronomer.

12. TIME AND THE INDIVIDUAL

The place of time in the continuum is most ambiguous and its dimensional significance in the unitary structure of the universe most difficult to grasp. Much remains to be learned about time and the

energy field and no one knows how long it will be before a completely satisfactory placement of it in the ultrahuman universe will be achieved. But it is apparent that it is the dimension along which fields of energy change, are transformed, grow and evolve. The lines of transformation of energy are the world lines, so called, along which an observer measures the passage of duration, either of himself or of whatever else he is observing. As the lines proceed, as time moves, something happens to the energy of the field—it becomes diminished, energy is lost, and its activity is lessened.

The extensions of time along the world lines of the continuum—dynamic time—implies that each field of energy is traveling forward, when watched by a three-dimensional observer such as a human being. The past, the present and the future are simply cross-sections of the particular portion of the continuum enclosed by the time lines. But as the three-dimensional observer is himself continually growing along the same lines, he is himself involved in that continuum. And as his activity of observation is essentially psychic in its memory of the past, awareness of the present and directiveness to the future—which are the indices of psychation—his participation in the continuum introduces a new factor which will have to be squared somehow with its properties, and the general scheme of its constitution.

In psychology there has long been in use the term “field of consciousness” to mean the field of immediate and confluent perception which is linked with the remembered experiences of the past and a vision of the future. The question arises: What is the relation of this field of individual psychation to the universal field of energy which is the continuum of cosmic psycho-activity? Is there any way of understanding their relationships coherently, if only by way of an image or an analogy?

In this design of universals, we cannot be satisfied with any belittlement of the individual field. The meaning of individuality, of individual consciousness, individual suffering and ecstasy, individual frustration and achievement, individual isolation from birth to death, cannot be dismissed as mere chimerical illusions lost in the totality of the continuum. Even if the universe must be conceived as constructed of ultrahuman dimensions, every human being cries out for the meaning of his personal history in the cosmic history. And even when viewed against the background of biological evolution there remains and must remain the question of the significance of individual differences of constitution and individual diversities of experience and activity in the relation of the life-personality to the equations of the

cosmic continuum. It remains to be discovered, therefore, how illuminating are these modern scientific conclusions about space and time and a cosmos of more than three dimensions for a new meaning of our individual isolated selves in the total scheme of things.

We have to imagine conditions in a continuum pervaded by activity moving along directions of concentration and dilution of energy—a whirl-swirl of beams and vortices—undergoing an evolution. Among the beings living in such a world who would breathe it unconsciously and for whom it would be no mystery at all, there could be no such isolation of the individual consciousness as is normal and inexorable among us. There would be an inevitable passage from a direct participation in its multiple dimensions to a communal psychic life within it. Among those educated in such a four-dimensional space-time continuum, and for whom it would be inborn to think of it as the natural medium of their lives, without distinctions of space and time, energy and matter, brain and psychation it would be just as difficult to conceive of an absolute separation of themselves as it is for us to regard ourselves as permanently connected. Only by reasoning and analogy would they arrive at the hypothesis that a segregated, completely individualized form of consciousness might occur as a self-enclosed completely isolated entity within the flux of disconnected lives.

A four-dimensional psycho-continuum would engulf all three dimensional psycho-activities, binding them into an integrated whole. Yet one of its mathematical inhabitants might speculate that conscious bodies may exist as three-dimensional entities, definitely set apart from others. He could prove that a super or inclusive consciousness of that continuum would incorporate all the psychic life of those subordinate three-dimensional existences, no matter how sure their egos were of their apparently inviolable privacy. An altogether speculative approach would have to be adopted by such creatures for them to attain a conception of isolated individuality which is human.

In their diagrams cosmic geometers might employ an image to visualize themselves. If the fingertips are placed on the glass top of a table, the fingerprints will appear as five separate areas. Upon that plane of consciousness, no impression except that of five different presences would be registered. No way of inferring the hand or of inferring the body with the hand, or of the body with its consciousness would be available, except to imagine the possibility of other dimensions and conjunctions for a frame of reference. In a world of ultrahuman dimensions, however, its constituent individuals, though

each is concretely quite defined, each with a separate consciousness, would be like those fingers, included and conjoined as the instruments of a more and more inclusive structure which would finally reach to the organism itself as a continuum of connections and powers.

A more complex geometrical diagram might suggest that the relation of an individual consciousness to such a cosmic continuum charged with psycho-activity be compared with a spiral whirling through a series of planes. For the whole universe seems to have a spiral structure which confers upon it the properties of both a sphere and a cylinder. The entire evolutionary movement of the cosmos suggests ubiquitous spiral design. If one were to conceive the universal spiral as the single vortex of all being, isolated individualities could be generated in its curves as the convolutions of its movements pass through various planes of its dimensions.

A sheet of still water can be imagined as a plane into which an object, say a stick, is immersed at right angles. Now imagine all the water drawn away except the surface film registering the movements of the stick in its vibrations. Every disturbance caused by movement of the stick would cause a series of waves limited only to two dimensions, the length and breadth of the plane. If now a descending spiral cuts through the film, a circle will be generated at its point of intersection with the plane. Should the spiral be held still and the film moved through it, all of the spiral will ultimately be represented as a continuous series of superimposed circles. Unity and multiplicity, the unity of the spiral and the multiplicity of its constituent circles are combined in the geometric figures of such a construction.

If each such film were an individual consciousness, each plane formation of the spiral would be interpreted as a circle—and as a circle only—and each circle would be an isolated world for that consciousness. For the individual in that film, at its point of contact with the spiral, would be a point revolving in a circle—the consciousness aware only of its own motion and emotion as a single convolution, and knowing nothing of the emergent spiral, which is the real producer of the phenomenon. Nor would he know, spontaneously at any rate, that his own life history is simply a record of intersections with a reality so much larger than himself.

That is how the psycho-activity of a dynamic continuum might be related to an individual consciousness of the human type. Under such conditions, individuals are not merely floating islands, beaten by the waves and storms of space and time, but the jutting outgrowths of a universal continent. A continuum invested with an all-pervading con-

sciousness, of ultrahuman dimensions, would have a significant and permanent relation with each individual film consciousness generated by it. Each of the various forms of human consciousness, animal consciousness, plant consciousness, would be real to itself as well as to the psycho-activity that we have been driven to postulate as inherent in the whole cosmic system. The parts would not be simply dissolved in the whole, as an illusion, and the meaning of lesser individualities for the whole would not be destroyed but on the contrary confirmed and preserved.

In the two-dimensional world, the plane of the film, at the level of the individual so formed, the illusion of completely separate and separately moving filaments of individuality could be overcome only by reference to the generating spiral. The intelligence of the beings of this two-dimensional world would perhaps finally lead them to imagine the three-dimensional world of which we are ourselves so sure. Two-dimensional creatures can never actually see or feel familiar with the three-dimensional world of their imaginations, though they may convince themselves intellectually of the truth of a formula demonstrating how their familiar planes coalesce in the world beyond.

In a cosmos of ultrahuman co-ordinates, the individualized constituents of the life-personality configure into that super-unity which is the cosmic psycho-activity. Yet it is most difficult, almost impossible, for each individual, though he be associated with the cosmic psychation and metabolism, to perceive himself as traversed and included by that ultrahuman consciousness. But every such individual, though he may seem to be doomed to regard himself as a point forever segregated in the circle of his own consciousness, may in the end learn to believe in the major curve in which he participates, and even to catch some glimpse of the totality of the spiral vortex in which he is being whirled to and for some unknown end.

13. HUMAN PARTICIPATION IN THE COSMIC

There are, then, two kinds of movements, two kinds of lives for human beings: one, the personal life, the effect of changes in the recording film, the temporary and transient modifications of its activity; and the other, the superpersonal, the data of transformations of the spiral as a whole, the permanent movement of life in the cosmos. That is, there is the individual life and the collective life, the individual consciousness and the cosmic psychation to which the personal being contributes. Every conscious human being, indeed every living thing, corresponding to one or another cross-section of the unrolling film, would play a part in the history of the higher being.

As regards will and motive, imagination and knowledge, there would be a certain resemblance, between the whole and its parts. Indeed, in all the principal and persistent aspects and behaviors of his life, the individual consciousness would at least reflect the cosmic being of which he appears as a form made as the film continues its course. In the end, the film and spiral are seen to be one and equivalent, like the fingers and hand of a glove.

The relatively insignificant personal histories of the included lesser components, as they see themselves in their world of the three dimensions, may not determine any tremendously important events in the history of a cosmic being of ultrahuman dimensions. The parade of their lives, representing successive waves of consciousness of the higher being, rise and fall as the convolutions of the different planes of the growing spiral unfold. Yet the smallest of these individualities is unique for each stage of the movement. Each is a variant, minute but specific and meaningful in all the details of its personality. Hence each contributes to the activities by which the higher being evolves. In the largest perspective, the smallest circles of the spiral are perceived as contributors to an ascending process, thrusting toward the organization and concentration of its energies. And they participate in the growth of that cosmic being, whenever they display in their wills and activities the characteristic features of the whole.

Upon such grounds may be gained some understanding of the relation of cosmic psycho-activity to the life-personality which it has begotten. We see an organic being of ultrahuman dimensions changing and developing as a whole and yet evolving in each and every one of its parts. If these changes and developments may be regarded as its metabolism, the forlorn isolation and ephemeral fugitiveness of the separate individual lives are shown to be wholly illusions. The seemingly complete disjunction of life on our planet from the rest of the universe, and the idea that it is but a skin disease of the earth's crust, are equally errors. No longer can the lives of Life be dismissed as a fungus fermentation, a meaningless accident in a world of arbitrary chance. For as that most inclusive and highest being alters as it moves in its courses, its sub-beings may effect those alterations as they direct and guide and control themselves, even in the minutest matters of their life histories, by their knowledge of the super-being out of which they have come. So there is an effect of the parts upon the whole as of the whole upon the parts, of the below upon the above as of the above upon the below.

Looking into the sky with the most penetrating telescopes there is not revealed, nor can there be revealed vestige or suggestion of a

mind-saturated collection of ganglia or brain cells. Nothing like protoplasmic irritability with its fragility and mutability is visible or can be made visible. Neither in the absolute zero of the interstellar dust, nor in the incomprehensible heat of the countless star systems, the nebulae and the galaxies, is there any outline of a nervous system. Nor is there any vision of dim filaments of nerve roots and fibers, nor indication of the contacts of nerves that must occur for us to feel and think, plan and decide. Yet the accumulating evidence is converging toward the conclusion that the living of our planet, as centers of psycho-activity, are continuous with and significant to an ultrahuman psychation embedded in the dynamic continuum of the cosmos. For the universe is an organized entity, to which a psychic nature must be attributed if all the facts gathered by science are to be accorded the complete significance to which they are entitled.

14. TOWARD A RE-ORIENTATION OF LIFE

Lost horizons are recovered, fresh horizons emerge with these conceptions. They have a significance for mankind that is as revolutionary as that which came of the proper placement of their planet in the solar system. While as yet mathematical rigor cannot be claimed for them, and many errors and omissions in their content remain to be corrected, they are the outcome of the work of a succession of mathematicians and astronomers, physicists and chemists, biologists and psychologists. And many more, countless more empirical and theoretical discoveries and revelations will follow after them. Yet with all the gaps and lacks apparent, the underlying lines of affiliation of the parts and the whole can now be discerned, stated and elaborated in a reasonably rational and understandable way.

For we of the twentieth century are coming to see that not only time itself and space itself, but matter itself and energy itself, cosmos itself and consciousness itself, are artifices of the organic constitution and the biological necessities of the human body. Only a space-time-energy-matter-cosmos-consciousness continuum may legitimately be regarded as the objective reality of things. The localized spaces and times, and the variable constituents and occurrences as they appear in the experiences of different observers are nothing more or less than different cross-sections of that continuum; nothing but different perspectives of cosmic psychation. In these re-orientations the individual loses his sense of isolated singularity and gains transfiguration. He becomes a changing but necessary relative in an all-merging totality of life and the cosmos. Instead of a sharply defined pattern of en-

closed consciousness, he can now visualize himself as part and parcel of a continuous flux of thought and will and design. To realize himself as such, he must reject the habits and attitudes imposed upon him by the water levels in his ears and the time-counting registers of his brain and those other organs and organoids of his feeling and acting which bind him to earth and confine him within his protoplasmic self.

A new and higher consciousness, one different in essence from all that has preceded its emergence, is waiting for this metamorphosis of the individual. The universe is tingling with a like-minded and co-ordinated psycho-activity throughout. New adventures of experience, struggle and creation open before him in the achievement of that new consciousness of himself. With the outlook of a conscious, in place of an unconscious, participation in that cosmic psychation, who is to say what is to be his future? As part of the life-personality behind which stands a cosmic psycho-activity, he sees himself as being intimately associated with all else in the universe, as belonging intimately instead of merely existing separately and arbitrarily.

For the universe-galaxy of which our solar system is part existed long before the earth and its inorganic and organic diversities. Psycho-activity must be deduced from its effects just as is radio-activity from its effects, and it must be conceded to be universally distributed. The presence of psychation must be recognized as a pattern of qualities, of which organized memory and organizing anticipation and direction may be regarded as specific. New ultrahuman concepts of the organization of the cosmos lead to some understanding of how a single super-being differentiates into its multiple constituents. The wisdom of this cosmic being extends to the preparation of the very properties of the ultimate units of the energy and matter of the universe, since it is upon them that all the subsequent possibilities and powers of evolution depend. These in turn are so exquisitely interdependent with the history of life as to be utterly inexplicable by chance alone. Such a concept of matter-mind for all the universe is as justified as the concept of space-time and matter-energy and is indeed implied in them.

Man can face the cosmos, not as a stranger but as its kith and kin. Yet is the individual only a structural component of a universal pattern with which he has much in common? Or is a more dynamic concept of participation possible for him? Does he make an active contribution to the cosmic process of which he is an organic part?

9

THE COSMIC DRIVE BEHIND CONSCIOUSNESS

AS AN INDUCTION FROM THE AVAILABLE DATA OF SCIENCE, THE PRESENCE of a universal psycho-activity, extending throughout the cosmos, leads us to the ultrahuman dimensions of the universe. In the light of this view, the lone organic individual would seem to be lost in the universal vastness. Again the question of the significance of the apparently isolated ego in the scheme of things poses itself. In a dynamic continuum can the parts possess more than a geometric meaning for the whole? In what sense can the individual be said to belong except in the mathematical sense of being just one more?

Cosmic psycho-activity is indeed a prime intellectual necessity for rational conception of the universe. Without accepting as a premise the existence of this universal psychic energy and its implications in the story of the emergence and progress of life, a great deal of knowledge acquired by human beings in their scientific scrutiny of facts and their meanings can neither be correlated nor understood. Many observations concerning the protoplasmic personality would remain unexplained and many of the known facts of preparation for life ignored. There is too much evidence of a unity and a continuity of substance, energy and action in the plot of the narrative for any observer to overlook its psychic significance.

Yet to admit a cosmic psychation in the inorganic precedents, the non-living roots, of the life-personality, raises certain issues inevitably. The human mind must dare to face these queries. For the problem persists: what of the myriads of lives, the countless organic individualities that have been, that are and that will be produced in the course of the history of life? They continue to be smoldering or flaming centers of consciousness, who perforce regard themselves as closed systems of feeling and willing, suffering and doing. What is their actual place in the cosmic pageant?

The limelight of science is thrown upon this minor planet of a

mediocre member of a single galaxy, this, our earth. Can it search out the soul of a man and tell us, in some fashion at least, what he is really doing in the universe? Can it show that he is more than a statistical unit, more than an inchoate fragment of the whole? If human beings participate meaningfully in the cosmos, is it possible to gain some insight into that meaning? There have been so many countless hordes upon hordes, billions upon billions of intense but puny flashes of consciousness, of passionate tiny lives that have flashed and then been snuffed out upon the universal scene. The cosmos is so overwhelmingly huge, the earth so minute. And human lives are the most minute of the minute. The precise astronomical proportions do not matter, but they dazzle our sight and confuse our vision.

The universe as we know it is enveloped in a mist of contradictions and paradoxes that interfere with any clear perception of perspectives and purposes. A psychic order and activity are inherent in the continuum of space-time. But that ordered activity seems as cold and distant from our own immediate lives as interstellar dust. We say that it is only natural that these unapproachable immensities should be far beyond our ken. Yet we long, we beings of the three dimensions, we carriers of the three water levels, to be reassured by the touch of godlike hands.

In the abysses of the alien cosmic medium to which the searching human intellect has led the human soul, in this maze of infinitesimal particles of matter, pulses of light and cracklings of energy, there is no apparent support for any such aspiration. All these elementary entities concocted of the subtlest physicochemical essences are engaged in an intricate dance. Electrons in their vortexes around protons, planets swinging around suns, suns gyrating in greater movements, all participate in the cosmic ballet. What does it present?

1. ENTROPY, THE UNIVERSAL DESTROYER

Human eyes, noting all the dancers in turn as they flash round and round in the celestial ballet, can only feel overawed by the strange mechanics of the spectacle, but without any identifying sympathy for it. For the fiddler who calls the tunes for the dances is indeed no superhuman entity of consciousness. It is the law of entropy, the ultimate law of the logic of the heavens. It is the law of the constant degeneration which is the universal law of the metabolism of the cosmos. Because of the relentless pressure of its own deterioration, as it passes from youth toward senescence, the restless universe is gradually becoming reduced to the status of death. If there were to

be any personification of entropy, it would have to be regarded, not as a deity but as a demon, the demon of darkness, the *anra mainyu* of Zoroaster who struggles eternally against the forces of light.

Entropy is the basic fact of the universe. And it is the very devil of the cosmos. It is the eternal destroyer for it is that which tends to level the world to a single plane of nonactivity by lowering the potential of energy as it is increasingly wasted. It degrades the high ranges and peaks of the world to a common plane. Its by-product will be the eternal accidia, the anergia or the lack of energy, which is in effect the final death awaiting the dynamic psycho-activity of the universe.

No matter, therefore, how and where energy may be concentrated, whether in the luminous matter of stars and suns or differentiated in the marvelous patterns of crystals and cells, trees and human beings, there proceeds this inevitable disease of their capacity for movement and organization which will end at last in total decease. Wherever in the universe there is action, there continues without surcease this steady scattering into the void of its power of action. As cosmic history has proceeded for a finite time and has a calculable past, its end somewhere in the finite eons of the future can be foreseen and predicted as an ultimate effect of entropy.

As much of a mystery as the nature of all primary powers and elementary essences is the nature of energy. Wherever there is activity, there is energy at work, energy operating, energy released and energy wasted. As space and time are abstract projections of sensory experience, the concept of energy is a similar projection of the human feelings of strength and weakness and the corresponding contrast between the dynamic and the asthenic. That projection has been refined and abstracted by the intellect into the concept of energy.

Energy always functions in time. Just as space and time are considered abstractions of space-time, energy itself is an abstraction of energy-time or activity. For energy and time are indissolubly united in activity. In every activity, energy has turned out to be discontinuous in its effects, to consist of unfractionable integers. It is as particulated as matter, and is composed of indivisible units called quanta. When observed in its relations with time, energy has been found to be as corpuscular, granular, or atomic as the substances with which it is associated in activity.

It takes time and energy to measure any activity. Even the measurement of the conventional three dimensions of space, itself an activity, involves time-energy. It would seem, therefore, that it would be better to speak of time-space-energy rather than of space-time as the formula

for the cosmic continuum. Within that continuum there may be perceived two kinds of discontinuities: the minutest lumps of discontinuity identified as matter, and the smallest pulses or throbs of discontinuity motivating it as energy. These are interwoven into a pattern of organization and continuation in space and time which has determined the evolution of the universe.

In that continuum the amount of organized matter and energy is dependent upon the flow of time, lessening with its increase. To the naive eye, time may flow like a river; but as activity there is no flux but rather a series of convulsions and explosions, intermittent, like the systole and diastole of the heart, and, like it, limited to a finite number of beats. No man can say how many, but the number is less than infinite, and there must come an end. Because of this tendency of energy to run downhill with time, to diffuse and dissipate itself, a gradual atrophy of the universe is in process. And the appetite of entropy, the devourer, grows by what it feeds on for it continually increases. Into its insatiable maw will ultimately fall all the activity of the cosmos, which may indeed be said to be dying from birth, much as an organic individual begins to die at birth, because of the exhaustion of his potential energies.

2. THE DESTINY OF ENERGY

Energy is like an electric bulb slowly dimming its light, because it is discharging its power without replenishment. In fact light is the very prototype of all energy and of its fate. All cosmic energy moves at the same speed as light and has the same vibratory constitution. Radiation is a form of energy and the melodic rhythms of the different wave lengths, or frequencies, of radioactivity are its spectrum. There is a great continuous range of radiating frequencies comprising all its known forms.

Light, white light, which can be analyzed into the seven frequencies of the colored spectrum, constitutes only one octave of the keyboard of these energy frequencies, which includes at least seventy known octaves. Interstellar space may seem cold and empty, but actually it is a roaring storm of these waves and pulsations. Radiating from their sources, highly charged areas of matter, these rays race and criss-cross in all directions. If they could be heard, they would render the cosmos a pandemonium of clashing cries; if they could be seen, a phantasmagoria of the most amazing colors. Human eyes and ears, by an understandable adaptation, are protected against so vast a maze of constant stimulation, which would make sleep, rest or concentration

of consciousness impossible. For no protoplasm could withstand the assaults of these jostling spirits of the continuum.

As these rays flash about with the same lightning speed, differing only in the amplitude of their systole and diastole, the expansion and contraction of their energies, they travel in straight or bent lines until they are absorbed or reflected by an obstacle. Waves and pulsations need not interfere with each other even if they meet while traversing the same areas of space. But if they differ in their frequencies and in the amount of potential energy they are carrying, the law of harmony that regulates their destiny causes some of their train to step down in frequency from higher to lower levels, from short waves to long waves. Until at last they reach the heat range in which a certain percentage of their energy becomes dissipated and lost.

Reduction in frequency of the energized waves of the continuum is the essence of the phenomenon of entropy. Necessarily this reduction can continue only to the point where all frequencies become identical—at their lowest level. The supplies of energy waves in the cosmos are incalculably immense, yet finite and limited. So in the end the universal formula applies: appearance of radiation equals the disappearance of matter, and disappearance of radiation equals the end of potential energies. That process carried to its logical conclusion will result finally in the cessation of all the activity in the universe.

3. THE RISE AND FALL OF THE COSMIC PSYCHO-ACTIVITY

Energy, whether liberated from the embrace of matter, radiating as light waves, heat waves, electrical waves, or as chained in the bonds of repulsion and attraction which are organized as the ultimate units of the atoms and molecules of matter, is the primeval essence of the cosmos, out of which all things are made and to which all things return. It appears in all the manifestations and transformations of the universe. It may appear as solid or liquid particles, as the incandescent gas of the stars and nebulae, as beams of light, as a consuming fire, as the purposeful mind of man, or as the profoundly brooding psycho-activity of the universe.

But for all and equally alike the inexorable law is the law of entropy. It can be predicted that the time will come when there will be no more energy to waste. All energy will then exist at the same level, so to speak, from which nothing can be lifted and nothing can fall. Such will be the end of the world: a universe in which nothing will happen because there will be no energy left for happenings. After its eons of stormy activities, the cosmos will be for a long while viscous

and slow, like a tired old man, and then there will come an eternal stillness, the rest of death.

Wherever a hot body cools, wherever a resistance is overcome, wherever work is done, some energy, as wasted heat or lost motion, is being transformed from its condition of differentiated power, concentrated like a coiled spring, into a state of diffuse and innocuous desuetude. The radiated heat of the stars is energy thus being dissipated. In due time all their peaks and troughs of turmoil will be leveled into a flatness of inactivity. Then in effect, there will be no energy but only its corpse, and no universe but only its bones. The involution of energy is inextricably connected with the evolution of all the forms and happenings of the cosmos. It is an ineluctable fatality of the universal continuum.

Now the history of the life-personality is and must be inextricably involved with this waxing and waning of the energy of the universe, of which it is the unique product. And the same must be true of that which is behind life, the psycho-activity of the cosmos. No matter where the cosmic psycho-activity is located and to what distant designs it may be directed, it also must face the law of the degeneration of its energy. As all living organisms themselves exhaust their store of vitality, descending to the point where destruction surpasses reconstruction and death overcomes them, and even as societies and cultures, empires and nations decay and expire, the very cosmos itself is doomed to follow the pattern of its microcosms. It too must lose its dynamic powers in the slow, creeping dissolution of all things and activities.

4. PATTERN OF THE COSMIC ORGANISM

Night reveals the all-encompassing firmament of space, strewn with myriads of suns. All speculation concerning the origin and fate of the universe has centered around the mystery of these visible and invisible stars. Advancing out of the maze of the earliest mythologies concerning their nature and office in the pattern of the cosmos, the skeptical curiosities of human intelligence have finally penetrated to the secrets of their constitution, envisaging its essence as the primeval and universal energy. Energy organizing and disorganizing: that is the last word from the stars to our minds.

The functions and values of stars in the life of mankind have been many. They have been useful for the exploring adventures of the species, practical signposts of space and time. They have served as lifesaving direction indicators, guiding mariners wandering on the

sea and travelers lost on the land. They have been gods and the symbols of the gods, the potent images of the ultimate unknowns, of eternity and infinity, of life and death. Finally they have become the true source—books of revelation—for the seekers of knowledge, narrators of marvels, whisperers of the secrets of the cosmos to men indefatigably intent upon finding the truth of things, who have questioned them as children question the tellers of tales. By their curious searchings into the ways and wanderings, the chemistry and radiations of these stars, an authentic picture of their composition, their history and destiny has been painted. Man's scientific knowledge of the cosmos is rooted in what their rays have done to his retina and brain, his intelligence and understanding. Their rays have proved to be not merely stimulants of the optic nerves, they have turned out to be the messengers of illumination for mankind.

The scientific design of the cosmos is that of a universe internally organized as a single unified entity. It is not limited to a tightly knit solar system with the sun or earth as its center; it exhibits all the stars as parts of one process of symmetrical and evolutionary motion and change. One harmony pervades the motifs of the cosmic symphony. We have achieved some conception of the time when these movements began and when they are bound to attain their finale, to play themselves out with no one left to applaud.

Much of the universe is not known, much must still be a matter for speculation, much remains to be discovered and measured and mathematically integrated into a single all-encompassing concept reflecting the true nature of the cosmic organism. Every year the observing astronomers and the calculating physicists struggle nearer and nearer to such a unity as a single field of activity, embracing in its totality all manifestations of time and space, electricity and magnetism, matter and gravitation.

It is now believed that the universe has proceeded out of an aboriginal explosion and expansion in a primeval center of an incredibly dense and unimaginably hot gas. Based upon calculations concerning the energy necessary for the formation of the radioactive elements, radium, uranium and thorium, this tremendous event—the birth of the universe—took place billions of years ago.

There are now known more than a million apparently independent island universes, the extragalactic nebulae and star systems whirling through space, far beyond the furthestmost stars belonging to the system of which our sun is one, the Milky Way. Each of them is rotating furiously about its center as is our own galaxy. Then there

are the inconceivably enormous continental universes around which insular universes are grouped. Within our own galaxy the stars are not distributed either haphazardly or uniformly, but tend to be grouped more densely around a central plane. The axis of the whole rotating system has poles, the galactic poles, and the stars thin out as they approach these ends of the axis. As a result, the shape of our universe is seen to be something like that of a watch turning over and over on itself and our sun is placed somewhere between the center and a pole of the system. According to the studies of astronomers there has been a smooth sequence of evolution between the most primitive and amorphous and the most recent and highly structuralized members of the cosmic organism. There is no evidence of any cataclysmic mutation or transition between them.

It is thus the privilege of modern man to embrace within his mind the universe of stars, incredibly enormous in extent and marvelously varied in its components. He can see as one the organic structure of the cosmos and its lesser members, the stars and its lesser mites and the least, the earth, and the microcosms that animal and plant bodies are. The solar system, although only a speck in space-time, is truly a part of the whole. It is a member of a colonial star cluster in the great galactic system of the Milky Way and it rotates with the rest of it upon an axis. That same Milky Way is pushing through space like the rest of the million spiral island universes at an incredible velocity. And they are all organically and functionally related.

Structurally and dynamically the universe is one organism. Matter everywhere, and energy everywhere, concentrated or diffused through space, and space outmeasuring the matter by prodigious immensities—all are organically related. An unceasing and interlocking drive of activity sweeps through the whole, the greater systems as well as the minutest constituents. It possesses an inherent organization, which entitles it to the name of universe—that which is a unity—and it is also an energetic unity. It is behaving as one, it is developing and evolving as a unity.

From the beginning of the cosmos a single movement behind all the other movements pushes on to its ultimate destiny. It is the most exciting perception of the astronomers. One evolutionary history seems to be unfolding in the entire range of stars and star systems, just as integrated as the more compact evolution of life on the earth. Island universes are constructed along the same lines as their brethren, the flaming discs of our galactic system. There may be some hundred

million stars in each of them. And throughout the systems there are lone stars and double stars, star clouds and systems, stars of all colors and all grades of brightness, but all essentially alike and all integrally related.

No matter how varied are the galaxies in all their magnificence of structure and size, chemical study by means of spectroscopic photography has also made it evident that the unity of the cosmos is not simply that of a quite complex but integrated pattern. Geometrically, the cosmic continuum can be conceived as designed along the lines of intricately curving, ultrahuman dimensions, a unity of time and space. But it is not simply an organization or mixture of materials or elements wholly different in different parts. Throughout its vast expanses there is also a unity of substance, an identity in the chemistry of its bricks and mortar, of its building stones.

If the stars and the different star systems of the cosmic organism may be compared to the cells and organs, to the varieties and species of the life-personality, there thus becomes apparent an underlying similarity of substance which is as profoundly significant as that of form and evolution. They are all alike in that they are constructed of the same chemical elements, just as all living things are composed of the same elements. Neither the sun, nor any other star, no nebula, nor most distant spiral island contains any element that the chemist has not isolated on the earth. Hydrogen and helium, oxygen and nitrogen and the other elements, discovered on our earth and sun and described, are found throughout the universe.

The cosmos consists of the same stuff everywhere. Meteoric iron, in the rocks which have been hurled from the outer reaches of space to settle upon our earth, is identical with iron mined out of the depths of the earth. The same is true for the other elements found in meteors. As far as the vision of man can reach through spectroscope and telescope, no unique or unrecognizable elements present themselves in the astronomical search. Matter is one—on earth, in the sun, in the stars, among the immensities of all the extragalactic system.

Thus the universe is seen to be one and the same throughout. It is one in the nature of its energies and activities. Electromagnetic waves are identical through all its space, so that light has the same velocity no matter where it is measured. And the pull of the gravitational energies is uniform and predictable no matter where the astronomer directs his calculations. In action as in arrangement there is universal identity throughout, as there is in origin and substance.

5. PSYCHO-ACTIVITY VS. ENTROPY

Psycho-activity and its concomitant, consciousness, as a manifestation of a particular kind of energy—psychergia—must also be universally distributed. Its nature is a mystery as is its mode of producing its effects. But the very possibility of its interaction with the other forms of energy amply indicates that there must be something in common between its activity and that of the others. More and more does it become evident that it will be necessary to assume the existence of psychic waves as of electromagnetic waves in the universal continuum. Among the continuities of the cosmic spectrum, such psychic waves, measurable at its extreme end, perhaps the smallest and the most penetrating that will ever be measured, may be discovered to be the carriers of cosmic psychation. At any rate, light, heat, electricity, magnetism and psychergia are all cosmically distributed. In the very nature of things they must be and are interactive in all the patterned aggregates of space-time. As the cosmos reveals more and more details of its nature to close inspection, there can be less and less doubt of that universal law.

Universes stretch behind universes in the space-time continuum. The stars and the star systems are spread out among the interstices of the cosmic organism. At some point in the remotest past, it has been calculated, all the vast matter of the cosmos must have been concentrated into what was then the true center of space. And all the star systems, the island universes and our own galactic systems, now so far apart, must have whirled together as one, turning round and round as a literally single universe. In that eo-universe, an inconceivable hot and dense gas—eo-matter—pervaded the original center of cosmic evolution. In that laboratory furnace, raised to over a million degrees of temperature, the various chemical elements were fabricated, the radioactive elements like uranium and thorium, the abundant iron and oxygen and calcium, the rarer gold and silver and platinum. Under the bursting pressures of this superheated, supercompressed medium, the universe exploded and began to expand. It condensed to form the cloud structures that have differentiated as irregular star islands and systems, and regular stars and planets. Upon one of them fell the lot of becoming the tiny habitat of the living, the protoplasm of genes and cells, organisms and personalities. The evolution of matter, energy and life have been continuing ever since as a single and co-ordinated history.

The same degree of development has not been attained in all the

parts of the total complex. Star systems and suns are everywhere observable in various intermediate stages of evolution. A continuous series of stages of metamorphosis have been observed; fetal universes, embryonic, infant, adolescent, mature and senescent universes. The wheel of evolution revolves at different rates in different areas of the cosmic scene. Some are fairly concentrated in bodies heavier than water, a class to which the sun belongs. Others are still in a much more dispersed state. And still others have condensed into the densest stars known. Some, like the dwarf white stars, so called, are a hundred times heavier than water, so concentrated has their matter and energy become. But all of them and all their events fit into a single scheme of activity, with a single origin, and a single destiny.

All the cosmic structures may be arranged in a hierarchy on the scale of condensation of different ages. But they present little evidence of having been born as the result of isolated events or accidents like the collision of dead stars or of any peculiar local catastrophes. Astronomers assert confidently that the genesis of star aggregates out of preceding star clusters, like their generation in turn out of more inchoate nebulae, are all incidents of a single plot, as it were, proceeding along the lines of a single evolution. The universe is unfolding as if it all originated in one primordial impulse of movement which has distributed itself differentially in the cosmic continuum.

Now the data of the formation and history of different life forms and of the conditions under which they have appeared and functioned have led to the concept of an immortal life-personality. A single though multiform consciousness of life exists, with protoplasm as its substrate. For its preservation and progress the properties of universal matter were prepared by a cosmic psycho-activity. At the same time the scrutiny of the different constituents of the universe and of its innermost constitution as a whole have discovered it to be a single being undergoing an evolution and generating a history purposively co-ordinated with that of life. The cosmos is a reality which can be understood only in such terms and conceptions, if it is to be comprehended at all by the limitations of the human mind. That then is the far-reaching conclusion we are approaching as the result of all of humanity's questioning studies and measured observations and of mankind's persistent and patient exactitudes and audacities of thought and experimentation: *A universal cosmic consciousness begetting a continuing life-personality is embedded in the roots of the universe. It is growing and driving through the eons of time toward some*

apparently entirely ineffable and incomprehensible goal. And it embraces within itself all the vast extent and range of time and space, matter and energy.

But the fateful phenomenon of entropy arises to oppose the universal process.

So stupendous are the dimensions of the cosmos, so endlessly various in their phases of growth, the stars of this universe would seem destined to last forever. Yet ceaselessly and without rest they are consuming themselves, dissipating their energy, radiating it away at a calculable rate so that the ultimate result is predictable. The inevitable moment is coming when every sun and every star that now blazes fiercely will have gone out as a candle. Then there will be no more light and no more life which is dependent upon light. That is the final conclusion to which all knowledge and logical analysis of the laws of activity of the cosmos drive the human mind.

An immanent cosmic being must know that it is finally as mortal as cities and trees, as the insects which live but for a day. Like one lost in the profound melancholy of deserts, the cosmic being must be aware of the ultimate ending. Trillions of years may elapse before its consummation. But it is constantly in the offing. This must be clear to the cosmic imagination. Immortality cannot be truly ascribed to that being of the universe—even though it may be burning brightly now—that must in the end burn itself out altogether. And with that finale, not only will life disappear from the earth through freezing of the energy necessary for its continuance, but it will become impossible for it to persist anywhere in the continuum to which it may have migrated in the interim.

If the universe itself must collapse in that final doom of its activity, when all its energy has been so radiated as to be uniformly distributed, death must be admitted to be the final destiny of the cosmos, of the cosmic psycho-activity itself as of life and the life-personality, its progeny. If the time threatens when the temperature of absolute zero pervades the unchanging scene, the cosmos is mortal, as mortal as the creatures that are born and live out their destined time. There is nothing as relative as time. To a superhuman mind, a thousand light years may be as a second is to us. So an inconceivable duration of time can be no consolation to it.

Time is so interlocked with the universal degradation of energy, and through that degradation with the downfall of the whole cosmos, that it too will then cease to have any existence. For time has reality only in activity. Time is as finite as activity, and there is only a

limited amount of it left for the evolution and involution of the cosmos. Time is lost as well as energy in the transformations that compose cosmic history. Entropy allows for no exceptions to the fundamental principle that time and energy are rolling downhill together, irreversibly. Any cosmic psycho-activity must also be involved in the consequent degeneration of the universe. At the end there will sound the finale of its activity as of time and energy. It, too, must face that Judgment Day.

Because what is done cannot be undone, because the events of the universe are what make its history, because time and energy have a past from which they can never again be dissociated, death, as the cessation of all activity, is the destiny of the universe. A certain amount of energy and an equivalent amount of time are lost forever with every event and every experience. At last the accumulative corrosions of entropy will attain their ultimate triumph, when that time comes when there will no longer be time, for there will be no energy. The cosmic psychation will be condemned to remain frozen in the absolute zero of every dimension, which means in effect, bound in the bonds of nonactivity.

6. LIFE AS ANTI-ENTROPY

The past, the present and the future of every living individual are all relative to the one absolute: death. That is a way of putting the law of entropy as applied to life. The death of the individual, his disappearance as a member of his species, is certainly as irreversible an event as his birth, his appearance within it. It is dissolubly connected with the diffusion of the enormously concentrated energy with which he begins life as a fertilized reproductive cell. Death is indeed the moment of registration of the ending, a crescendo of entropy in the individual, and it may be slow or fast, gradual or climactic.

Every activity of the living body and of every organ and cell is altered by time. Life grows old as it becomes progressively less and less capable of accumulating energy to make up for its losses with the passage of time. This continuing process of organic anergia, comparable to progressive anemia, may be called protoplasmic entropy. Protoplasmic entropy and cosmic entropy are so related that one illustrates and illuminates the other. So that to say that the cosmos will one day enter into a state of energy standstill, which is the equivalent of death, is no metaphor but a legitimate extension of our deepest conviction, our most profound fear, the fear of death.

As individuals have died, families dissolved, species become extinct and life of every kind and description passes, the universe itself must at last undergo the same ultimate dissolution.

But our realization of the universality of entropy may provide us with a new understanding of the relations of life and the cosmos. It becomes possible to believe that, aware of these ultimately destructive effects of the cosmic laws, the cosmic psycho-activity has organized a constructive countermovement in the synthesis of the life-personality. The perception that the cosmos is slowly, ever so slowly, dying, that it is committed to gradual suicide as an inevitable accompaniment of its activity, may help us to interpret the emergence and evolution of living organisms on earth, their characteristics and activities as parts of a single cosmic pattern.

The green plant traps the energy of sunlight and builds it into the compounds of sugars and carbohydrates, fats and proteins, as well as vitamins and innumerable other chemical compounds. Other plants and animals, ingesting these, analyze and digest them, splitting them into parts with the smallest possible expenditure of energy and then rearrange them into the enzymes and substances specific to themselves and their own needs. Protoplasm has the most complex chemical composition and in consequence, the most concentrated concatenation of energy in the universe. And organic chemists have remarked again and again upon the way these complicated patternings of substance in the chemical reactions of protoplasm proceed with an economy and efficiency of energy expenditures justly envied by them when they endeavor to imitate them in the laboratory. For the phenomena of life within the degenerating cosmic organization have arisen as structures that constitute at least temporary attempts at anti-entropy.

The specific fitness of the cosmic and planetary conditions for the appearance and survival of organisms may be viewed as the preliminaries and preparation of the drive of a cosmic consciousness against entropy. The evolving forms of life then would represent, in their successive manifestations, a series of ascending arrangements of living matter which result in an increasing efficiency of the binding and storage of energy, that are the very antithesis of the entropic process. All the keenest observers of life have commented upon its devices for capturing and holding energy and regulating its consumption.

The contrast is striking between the universal disintegrations of energy in the nonliving and the vital integrations of energy in protoplasmic structures and functions. The movement of its energy from

the inorganic to the organic provides illuminating insights into the cosmic struggle of entropy and anti-entropy. Hydrogen atoms are compounded of the elementary units of matter and energy. As the unit of the aboriginal cosmic gas of the eo-universe, it contributed to the construction of the heaviest, most highly energized chemical elements. The energy of atoms constructed of the lighter elements united to form the more tightly bound molecules of the denser gases, and then come the tensor storages of energy that manifest themselves as liquids and solids, colloids and crystals. A gas like carbon dioxide and a liquid like water, peculiarly fitted to combine, join and collaborate with other elements to form protoplasm, whose capacity to bind energy into larger and larger aggregates is at the bottom of its supreme secret, the secret of growth. By that secret it has spread from its localized microscopic beginnings, all over the earth, proliferating everywhere in the slime of its seas, upon its lush lands and driest deserts and the uppermost reaches of mountains and the air. If it were not for the eliminatory effects of the environment—natural selection—protoplasm could cover the surface of the earth, choke the seas and blot out the light of the sun by the combined effects of its syntheses of energy as it grows and reproduces itself in the form of organisms, ranging from the ultramicroscopic to the grossly macroscopic.

Growth is anti-entropy in that it represents an assimilation of matter and energy preponderating over dissimilation and dissipation. Indeed, the whole history of the progress and evolution of living matter may be said to be the devising of ways and means for overcoming the law of entropy. In the creative cycles of metabolism and in the chemical accumulations of growth and reproduction by which matter and energy are concentrated in cells, entropy seems to be defeated, for a time at least.

Metabolism is a cycle of two phases: anabolism, the phase in which the living tissue is made vital and energy stored, and catabolism, the phase in which the substance of the protoplasm are burned or changed and the energy lost. During anabolism there is a positive balance of matter and energy, that is to say, construction dominates over destruction. No growth of the body like that of infancy and adolescence can occur unless there is such preponderance of anabolism over catabolism. During the period of maturity anabolism just about equals catabolism. Finally, entropy, slowly or incontinently, succeeds in overcoming the antagonistic devices of the living and the resulting imbalance ends

in the negative balance which means degeneration and death for the individual.

To counteract that triumph of entropy, each species of which the individual is a member, has promoted another invention—the method of self-reproduction. By the continuities thus established the living are seen to be incorporated in a series and as a whole. They are then seen to be one personality, linked all over the earth, for they have proliferated and multiplied as a single accumulation of protoplasm. In consequence, the life-personality has succeeded in creating a positive energy balance, an overwhelming excess of assets rather than deficits of energy potentials. In the long history of cosmic evolution, the forms of life are the only truly progressive systems because they are the only structures that have increased their total usable energy. So they represent in effect an answer to the law of entropy.

There have been some attempts to demonstrate that processes contrary to entropy may be active elsewhere in the depths of space, at a lower level than that of life, the level of the formation of new elements from older ones. When the cosmic rays with their enormous charges of energy were first discovered, it was suggested that they were the natal cries of new matter created in interstellar space. An actual reconstruction of heavier elements out of lighter might have argued the rebuilding of energy into matter. Consequently the existence of an offset to the destructive drift of entropy might have been accepted. When a more detailed study of the cosmic rays disclosed properties incompatible with that hypothesis, it was abandoned.

There is much evidence for the belief that the heaviest elements were formed at the earliest stages of the history of the universe. After the eo-universe, in the stage that might be called the paleo-universe, most of the stars of the receding stellar islands had become so hot because of increasing gravitational contraction and compression of their contents as to become subatomic power engines. They liberated heat energy through the splitting effects of nuclear hydrogen bullets smashing into the light elements deuterium, lithium, beryllium and boron. The residue of these reactions, helium, was formed during the longest period of the evolution of the stars when they appear as "red giants."

When the supply of light elements was exhausted stars entered a new phase of their evolution. In this stage, the stage of the white or yellowish-white giants, heat energy or radiation was engendered by a transformation of hydrogen into helium through the catalytic action of the elements carbon and nitrogen. These, curiously enough, possess

properties which fit them as uniquely for their role in the cyclic regeneration of stellar energy as they are uniquely fitted for the cyclic processes of life and protoplasm.

In the course of these changes the sun seems to violate the law of entropy and instead of becoming cooler with the passage of time will become hotter. Indeed it will become so hot that it will scorch and carbonize every living thing on earth in several billions of years. Then it, too, like many other stars, will attain its period of greatest luminosity and heat and contract and cool, passing into senescence. And although numbers of new stars are still constantly being produced out of the primeval gas remaining from the original eo-universe, it is predicted that in about ten billion years, the cosmos of infinite space-time will be sparsely populated by receding dead or dying stars, for their birth rate will be steadily going down and the death rate constantly going up. And that universe will continue until the final triumph of entropy at the level of absolute inactivity.

Only upon the earth can a true and cumulative reversal of the law of entropy be said to be realized in the activities of living matter. The outstanding significance of this fundamental fact cannot be overrated and a meaning for it must be sought. Even the most thoroughgoing mechanists have been compelled to admit it as a basic point of distinction between the living and the nonliving. That talented physical chemist, Wilhelm Ostwald, once defined biology as "the science which deals with those chemical systems which possess a stationary condition of their energy, as manifested in their nutrition and reproduction." In other words, the living are the systems which have the capacity to protect themselves against entropy, as the non-living cannot. That capacity is indeed the specific and outstanding characteristic of living organisms.

When a candle burns in the air, for instance, it will continue to burn so long as there is any wax or tallow and a supply of oxygen. It is a familiar fact that living organisms consume themselves and oxygen in an almost identical manner, with the same end products, carbon dioxide and water, for they are burning all the time also, as long as they are alive. But the candle burns itself out quickly because it has no anti-entropy process. In every living organism, anabolism, the constructive side of metabolism, proceeds continuously, keeping pace with the destructive side—catabolism. A living body is quite different from a candle because it is part of an energy transformation system which has not only been burning—releasing energy through

combining with oxygen—but also accumulating and storing it for as long as protoplasm has existed.

An unbroken chain of matter, metabolism and memory, as displayed in the linkages of the living cells of the evolutionary series, seems to reverse the law of entropy constantly and continuously in the realm of the life-personality, and only in its domains, as far as vision can reach. In the cosmic metabolism, in the immense regions of the galaxies and suns, there is everywhere, as far as we can tell, a universal catabolism, a tearing down of matter and a degradation of energy in heat and radiation. Entropy increases everywhere with every flash of activity. But anabolism, the building of matter and energy into more and more highly organized formations, predominates only on the earth, as far as we know. Wherever the life-personality is functioning to reproduce and multiply itself, there and there only, the law of entropy is being defeated.

All those who have reflected on the principle of entropy have been impressed with its fundamental significance for any conception of cosmic history, of the rise and fall of the universe as a whole. As they have become convinced of its rationality, they have been depressed by its fatality. For entropy is the great disturber and disintegrator of all the continents of the universe. It makes impossible the attainment of any dynamic equilibrium that would mean peace and rest anywhere. It stirs a restless tide and undertow of activities within the continuum foundation of the cosmos. By its machinations we are permitted to sense the fluctuations of phenomena, to measure time and record events. Its revelations must have the deepest ultimate meaning for any concept of life and its world.

The accumulative effect of entropy is also the clue to the history and timing, the measure of the beginning and end, of all our personal experiences, for they always involve an expenditure of energy. And all our orientations to reality are connected with it. All that has been, all that is, all that will be of the living world, are inescapably subject to it. Yet, they alone, the experiences of the living, of all phenomena, seem determined to escape from it, a fact of the utmost significance for our understanding of their place in the universe.

The perception of entropy is the recognition of a cosmic metabolism which is decisive for the destiny of the universe. Any psycho-activity of the cosmos, aware of its existence, would be at once confronted with the inexorable downward slope of its own psychic energy as of all the other energies. Imbued with an ancient wisdom beyond human imagination, capable of an invention that permeates the most

ultimate particles of matter and confers their life-adapted properties upon the earth-inhabiting carriers of its consciousness, it must see and have seen its own fate foreshadowed in the death of stars, in the white dwarfs and blue giants that tell the fateful story. The ultimate twilight of all the psychation in the universe is predicted by what is happening and has happened throughout its ranges.

Man has become aware of this constant corrosion of cosmic energy only in the last hundred years or so. In that short time he has become conscious of the degeneration that will terminate in universal dissolution. Now he sees the identity of that entropy with the cessation of all that is dynamic and active in himself, the ending that is death. And he sees it generalized and diffused, not only all over the earth but over all space-time, throughout its continuum, to its extremes. All is to be consumed to satisfy its omnivorous appetite and to terminate in the establishment of a universal equilibrium which can only be described as the death of the cosmos.

A superconsciousness meditating over itself and its destiny for billions of years must have been aware of that denouement from the beginning. And so from the beginning, the contrivances of the strategy and design of a movement running counter to the entropic flow of time have been in the making. Psycho-activity engaged in a titanic struggle with entropy—that is the intelligible vision of the cosmos our limited minds have at last produced out of the darkness in which they have groped for thousands of years.

We can now look with new eyes upon the making and evolution of life. A progressive organization of energy systems builds a hierarchy of material aggregates. The combination of molecules proceeds, from gases through liquids and solids, from the amorphous to the crystalline, from colloids to protoplasm, slowly and steadily through the ages to the thinking, searching, learning and conquering brain of man. The history of the adventures of the life-personality is revealed to him. And so at last he comes to see his own central position in the gradual working out of manoeuvres in that eternal struggle between the psychic will to construct and to create and the inexorable counter-moves of the forces of destruction, immanent in the nature and logic of things.

7. MAN AS THE MASTER OF ENERGY

Like the history of the life-personality, the history of man is that of a war, ceaseless and unrelenting, with entropy. Man himself is intent upon defeating the entropic process. He is intent upon conquer-

ing it as he strives for greater and greater command over those elements and forces of his environment which reflect the constitution and character of the universe as a whole. Whenever he grows and reproduces, in flesh and blood, in machines and arts, in his concepts and ideas, whenever he defeats destruction or disease and postpones degeneration or death, he is conquering entropy.

The attempt may seem utterly desperate and hopeless from the human point of view. It may seem the devising of a perpetual motion machine—every perpetual motion machine has been an attempt to defeat the law of entropy. Yet the cosmic drive behind consciousness is not to be gainsaid by the lack of human understanding or human logic. The cosmic consciousness sees the attainment of the goal; man sees through his faith in it. An ancient bond of continuity between man and the cosmos is thus established, an indestructible and universal bond, stronger than anything that could be forged of transient matter or visible but perishable substance.

A long lost emotion of cosmic kinship and participation is thus legitimately restored to human personality and the human heart. Man was once persuaded that the earth was the center of all starry space and he himself the center of the earth. It was an erroneous persuasion but it added infinitely to his dignity and stature. Now again he may look upon himself as a son of the universe in harmony with its deepest running and strongest surging forces and aims. For man is engaged in assisting the profoundest purpose of the universe. As the very head and brain of the life-personality, he becomes conscious of his high position and destiny in the cosmic plan.

Unlike the old anthropomorphic earth-centered attitude is this new placement of man in an intimate kinship with the cosmos. In that he again becomes universe-oriented, human individuality should regain the assurance that it is not forlorn in its aspirations and that a bleak isolation is not its inescapable fate. For man is involved in a quest that links him with all that is significant in the history of the heavens. And as man succeeds or fails, the universe succeeds or fails. This makes him an integral and inseparable part of the whole, for which he lives and from which all his dignity and pride worthily derive.

Man was evolved in order to defeat the law of universal dissolution and the insidious death of entropy. He performs a cosmic function. The discovery of the energies of heat, light and electricity made him conscious of new responsibilities in his planet world. The discovery of the universality of energy and the perception of himself as

bound up with the greatest research in the universe—the search for the control of the laws of its degeneration—opens a new consciousness of his creative role in the cosmos as a whole.

The study of the universe, including all the figures in the harmonic suite of man, matter and the psycho-continuum, has led to the emergence of this prime issue concerning energy. Behind all the varied and protracted proliferations of the cosmic psycho-activity, he perceives a continuing drive. Its objective is the acquisition of insight into the means of concentrating energy into the organization and reproduction of systems. That drive has found its nidus on earth and its instrument in the life-personality, and man's consciousness of his destiny and function can be the source of a new dynamic stimulation for its continuance.

The organization of life is essentially anti-entropic. Life forms as they become more and more complicated represent increasingly improved and effective modes of snaring and tensing energy in dynamic systems. By a combination of variation and reproduction, more and more efficient structures for evading and overcoming the law of entropy have been built in the evolutionary series of living organisms. Spreading themselves over the earth these increase by a law of geometric progression which may yet include all of the cosmos.

In every one of its forms life struggles as anti-entropy. The amoeba represents anti-entropic advance upon the bacteria as do they in turn upon the simplest formless protoplasm, the viruses. And the multicelled animals and plants as they conquer the destructive forces of their environment invent and devise better and better modes of storing and organizing energy. Until at long last man raises his eyes to the skies as a self-conscious enemy of entropy.

The economics of energy is the secret of the adventures of the life-personality as a manifestation of the cosmic psycho-activity. The fight against death, both of the individual and of the species, is carried on correspondingly in the most intimate relation to the driving forces of both. In the progression of the evolutionary movement from lower to higher among both animals and plants, the central fact of their advancement is the more and more effective organization of energy in the tissues and organs, and the more and more efficient release of it in their functioning. That is the most general way in which progress from the lower to the higher in evolution can be accurately rated.

At the same time individuality becomes more distinct and defined. In man the organization and individuation of energy has reached its culmination in the consciousness of death. The scientific realization

of the problem of entropy as the cosmic problem is a generalization of the problem of death, as the individual has to face it. The solution of one will be the solution of the other. Life, then represents and expresses the awareness by a cosmic psycho-activity of its own potential death. It has evolved as a principle opposed to entropy—an anti-entropy—which, perhaps having been tried elsewhere, is now being tested on our planet. It is the cosmic drive which has produced the earth, protoplasm and all its evolutionary variations. The logic of such anti-entropy for the whole cosmos still remains to be solved, and probably can be evolved only by a superhuman consciousness lodged in a superhuman brain. That, as far as the human mind can at present reach, seems to be the cosmic drive behind the life-personality.

A colossal cosmic conflict is thus unfolded to the vision of man as his intelligence penetrates the secrets of the continuum out of which he has differentiated. And therewith he sees himself not simply as a mere minuscule of a spectator or as a pathetically microscopic bystander whose curiosity can only stare at the strange pantomime and alien language of the prodigious play on the cosmic stage. A new grandeur becomes restored to him in this vision, and the magnificence of being once again a protagonist in a struggle that encompasses the whole universe. He becomes the vanguard in a universal battle and a never-ending war. His ancient intuitions of participation in the combat between the powers of light and the powers of darkness are once again justified and revived. Now he is one of a mighty host and the cosmic drama is no longer obscured for him by superstition, or fantasy.

Man is not simply the by-product of the gigantic mechanism of a universe ruled by chance. There is good reason for believing there was prevision of his coming and functioning, as indicated in the provision of the most favorable habitat and conditions for his protoplasmic ancestors. And in his body and brain as in theirs, there is ample indication of a psychic determination of his history. In these perspectives his place in the universe takes on an added significance dependent upon his origin and evolution, traced directly back to the dust of the cosmos and the waters of his earth. There is nothing arbitrary, and there can be no arbitrary explanation of the unique fitness of the congregations and concussions of the atoms of his being, that combine to make his appetites and urges, his fears and angers, as well as the cells and fluids, the tissues and organs of his bodily structure. And there is nothing arbitrary, there can be nothing arbitrary in the fact that the life in him has worked steadily and progressively to over-

come and counterbalance the power of entropy as the great evil of the cosmos.

Although as regards his relative size man is but a granule of that cosmos, he functions significantly in its field of psycho-activity that extends out to its uttermost limits. He may be alone on his planet but he is not hermetically sealed by his isolation within the boundaries of his organic self. He may be only a mote of consciousness, but he does not float in a miasma of senseless chaos. For he belongs to a more inclusive being in a way that cannot be measured by merely quantitative criteria. In spite of his latent bestiality, he has come to this realization of his origin and objectives. And in spite of the brutality and weakness, the cruelty and littleness to which his individual vulnerability makes him subject, he fulfills a cosmic function.

In the plan of things, when in his noblest thoughts and beliefs, and in his sincerest hopes and aspirations, he strives to enter into the chambers of the profoundest cosmic mysteries, to clutch the stars, it is not vanity of vanities. The individual personal consciousness, burning brightly for the purposes of self-preservation, self-aggrandizement, self-propagation, may be but an episode in the life of the species until the moment of his decease. The species itself may be but a chapter in the continuing story of the life-personality. Yet those labors and sufferings do not dissolve in futility, but join in a swelling diapason of purpose and accomplishment.

In the cosmic metabolism there is everywhere a predominance of the tearing down of matter and a catabolism of energy. There is a vast universal movement toward the destruction of all that is dynamic—the cosmic equivalent of personal death: entropy. Only where there is life is there a building up, an anabolism of matter and energy. There is a gathering countermovement in the achievements of life which forecast the ultimate control of the mechanical downdrift and the final triumph of the cosmic psycho-activity. Coming to a co-consciousness and co-realization with the cosmic psycho-activity itself of what threatens its extinction, man strives to learn how to deal with those wounds which presage its fate.

We, the sons of experience and suffering, of trial and error, of ignorance and insight, of failure and ecstasy, are accumulating a wisdom that may overturn the foundations of the inexorable logic to which we seem bound. At least there is the challenging call to effort and achievement for each human being to add his mite to the conquests of that basic rebellion and revolution, for the dethronement of the universal lethal law of waste, by which the cosmos shall be

saved. Man is an organ of the cosmic which he serves. He will continue so to serve, and more and more effectively, in the researches and productions of science and art as he will come to see himself dedicated to his great task in the history of the universe.

10

THE LIVING AS A MULTIPLE SPLIT PERSONALITY

IT IS POSSIBLE TO CONTEMPLATE THE MULTIFORM MANIFESTATIONS OF life as an enormous invisible entity, indivisible in its essence, a constant underlying all its varieties. And it is possible, too, to look upon its history as the biography of a single immortal personality. But a profound skepticism of any such belief arises in any observer of the actualities of the living as soon as he returns to the real world of immediate perceptions. All appearances bear witness against it.

1. DOUBTS CONCERNING LIFE-COSMOS HARMONY

Nothing seems as emphatic in the vivid flux of daily experience as the sensations and events of sharply and antagonistically divided individualities and groups, emerging out of the direct and insoluble conflicts of their differences and interests! About us on every hand are conspicuous countering and crossing of purpose and effort of all the living beings that populate the earth. Whether they crawl slowly upon their bellies, fly swiftly into the empyrean or proudly lift their heads above the level of the ground, disunity and division seem to command the scene. Everywhere there meets the eye the accumulating testimony, reinforced by a persistent voice in the hinterland of every consciousness, that, primarily and instinctively, the hand of every living thing is raised against every other.

As for the conception that life is the single deliberate offspring of the most ancient gestations of the cosmos, a purposive concentration of its energies, harmonic with its deepest designs, that seems hard to believe in the face of these hostilities. Transient and bleak is the prospect the universe offers to the individual who surveys his fate. His life seems an evanescent flash of lightning compared with the vast durations and extent of universal darkness in which he gropes his way.

Is it really possible for us to accept objectively this picture of personal and ancestral kinship with a cosmic being who, because

of the limitations of human intellect, must remain eternally hidden behind an impenetrable curtain, veiled in ultrahuman dimensions and wrapped in the silence and stillness of stars and space?

Cosmos, the interested begetter of man! How can man, as he peers into the unfathomable abysses of the universe and absorbs its unbearable immensities, the infinite ranges of endless dust and gas, the dizzying vortexes of radiation and light that extend farther and farther outward with each second of its duration, dare that thought? How can he genuinely experience any sense of kinship with it? Can he sincerely feel his significant participation in its history without some miracle of revelation?

By the cunning of his intelligence and intuition he has constructed what he believes to be a scientifically valid and therefore credible model of his cosmos. Thereby he has come to realize his own position on that speck of it which is his earth. And what does he see but blind forces, the arbitrary operations of inanimate energies, clashing and disrupting one another, even as he himself perpetually engages in combat and destruction with all his fellow creatures, human and subhuman?

Out of a whirling vastness and vacuity comes a swiftly rotating mass which engenders upon its surface of shallow waters the chemical compounds that mean life. Slowly, so slowly that it is utterly impossible to grasp the immensity of the multitudinous ages involved, life diffuses through the seas to the land and into the air. An instrument for concentrating psychation, the gray matter of the brain, finally appears, expands, and grows to take command of its existence.

The whole story is the long tale of excitement and bitterness, the hopeless striving and final extinction of the countless, the hopelessly countless, individualities who contended for a moment of life and a spasm of intensity. Then they dissolved into nothingness in the most curiously long-drawn-out adventure in the evolution of the universe, the individual life history. At best, the story resembles the gibbering narrative of a madman recounting the terror of incidents that have no meaning at all as far as the rest of the cosmos is concerned. Psychopathic aberrations of men but reflect the insanity of life as a whole, and only a lunatic imagination could conceive order in such universal disorder.

2. CONFLICTS WITHIN LIFE

What is the meaning of the coming and going of the individual? Is he utterly unknown and unimportant to the distinterested, completely indifferent reality which is the cosmic psycho-activity? All the

separate lives and all the solitary suffering and painful misery, all the blood and tears, all the sweat of labor and striving, all the hopes and fears, all the ideals and aspirations, all the achievements and all the designs of the individual, appear arbitrarily and irrationally evolved for a destiny that ends at last in nothing and destroys itself. He has emerged out of something which cared nothing for his appearance, history or significance, and he disappears with its disappearance.

If that be the whole story of the fate of life and man, not unity but disunity, not purpose but a complete confusion are the evident conclusions, for wherever living things breathe and breed, they compete and struggle for their very existence. Utterly enigmatic and entirely incomprehensible seems the conception that the hearts of all the living, animal or vegetable, are beating in the same fundamental diapason, because they are made of the same substance, almost as if by the same hand, all parts of the same drive, working to the same end!

Truly, the crowded spectacle of the struggles of these individuals seems to exhibit not a unity but a huge dispersion of psychic life. The more highly developed they are, the more evolved, the more intelligent, the more powerful—the more intent are they upon their fears and greeds, their desires and passions; indeed, they seem alive and conscious only as long as they are driven by these impulses, and fall into sleep as soon as their little moments of instinctive aggression have passed. Moreover they appear to be particularly built and constructed so that they may more effectively assassinate and devour one another. Each tiny consciousness is the center of an eager ego, burning for the assimilation and acquisition of all the life about it that can fit into itself, whether it be vegetation or animal. Their rivalry is the eternal enemy and disintegrator and destroyer of the co-operation and co-ordination which one would expect in the members of a really single being.

Slowly they have evolved the wonderfully and strangely organized structures of which they are made. Yet on inspection most of these turn out to be either instruments of aggression or apparatus for protection against aggression. Muscles are made for attack or for escape, bones for support in either action. Many of the persistently surviving organisms possess needles and thorns for tearing and puncturing each other's flesh. They manufacture toxins and poisons for the corruption of one another's blood and they improve claws and fangs to cripple and defeat one another. Or they use a subtle parasitism which works through threats of injury or tricks of mimicry so that they may for a time postpone their own demolition and final return to the dust.

Each of the living has a will to power for itself and a will to death for its neighbors. Can these be the manifestations of a single life-personality? Can we conceive all these struggling contenders for air and life, for their individual and specific protoplasm against all interference, against all comers, openly and daringly, or secretly and insidiously, undermining, assaulting, and, in the contest, consuming one another, to be brothers and sisters of one family under their skins? It seems utterly impossible, inconceivable.

The entire scheme of the living world would appear to be interpretable only as internecine struggle for survival of starkly separated individuals, of animal against animal, animal against plant, plant against animal, species against species, individuality against individuality. Moreover, it is a war without armistice and without quarter. Because of this incessant conflict no living thing is even remotely capable of prolonged happiness, or even of lasting freedom from the threats of pain, degradation or extinction.

In the conflicts of superiority and inferiority, of strength and weakness, the whole conception of a oneness of all the living appears completely liquidated. The currents of life do not empty into the great ocean of a single personality, but dessicate and destroy themselves, rivulets that dry into a desert of nothingness. The details of the wars of organisms are apparent to the most casual eye. They have become well known as the facts of natural selection and sexual selection.

How can life be regarded as an integrated whole, in view of all that is known of the horrors and atrocities that punctuate that universal war? Separateness and isolation becomes so loudly the dominant notes of merely keeping alive as to drown out whatever there is in common between every individual and his fellow creatures. Even the conditions of their proliferation can make only for the continuance and exacerbation of the manifest disunity between different species and individuals. Their struggle for existence depends upon the inexorable law that the availability of food cannot keep pace with the sexual mechanisms by which the members of a species are increased. What then but inevitable and incessant battle can follow?

The reproduction of any species tends to increase its members out of all proportion to the increment of procurable food, so that even within the species the competition for food stimulates and augments the forces which disrupt the conjunctive influence of blood and family instinct. In such a struggle, the stronger and the craftier, the more courageous and the more resistant subdue and exterminate the weaker. Life does not simulate the mutual recognition and realization

of kinship to be expected from a universal unity. It does not pretend to the harmony and contentment emanating from the spirit of co-operating parts. Rather, does it present an uninterrupted flow of omnipresent and perpetual unhappiness and anguish inherent in the conditions of its being and maintenance. Perhaps primeval protoplasm, possessed of the faintest glimmer of consciousness, with no foresight or premonition of the evils it would hand on to its more highly organized descendants, had long stretches of feeling at peace with the environment. But its descendants are never so favored.

A catalogue of the details of torture inflicted upon one another by the living would outnumber all other data accumulated by biologists. How then can anyone contend that such a conglomeration of enemies is really a single entity? All the tissues of a human being must be kept in a constant state of preparedness against attack by large things and small. There is a constant unconscious anxiety pervading the individual due to an emotional receptivity to fear and loss, especially the fear of loss of what is most valued, life itself.

All of his life man must constantly present an unyielding resistance to the bacteria which infest every surface and cavity of his body, ready to invade and destroy with their poisons. It is rare to find in nature one creature that is truly free of the taint of parasitic pathologies. The bodies of animals, wild as well as domesticated, reveal the ravages of bacteria, entozoa or worms. The flowers of the field and its grasses, the mighty growths of a forest, the creatures of the jungle and the stable, the highly organized and the lowly, all alike are prey to some enemy. There is as much parasitic disease among the lowly plants as among the animals that range above them and feed upon them.

3. MAN'S CRUELTY TO MAN

The drama of life is that of a vast host engaged along countless fronts in a battle that can never end in any treaty of peace. Thrusting out the might of their individualities, creatures assail, poison, or rip and tear one another, mutilating and stunting or getting mutilated or stunted. In all the ranges of the lands and oceans, deep in the woods and thickets, in the tropics and at the poles, there is repeated this everlasting motif of tenaciously proliferating and hopelessly divided life. It is as if the very spirit of destruction, jealousy, spite, envy and malice, permeated the scene. Either openly or under a surface of seeming tranquillity, there is a constant scheming and searching, jostling and scrambling for food, shelter and reproduction.

Under the drive of their most vital elementary instincts, the living are absorbed in these acts of injuring and devouring one an-

other, choking and massacring one another. Until at last their own vitality lapses and, from being pests and parasites, they become the victims of other pests and parasites. Moreover, wherever there is corruption and decay, wherever there is pain and suffering, the chances are that there are some of the living who are prospering and multiplying at the expense of others. In the long run there is effected a species of justice—the survival of the fittest—which is regarded as normal only because it is universal.

What place has this brutal justice of battle and conflict, of struggle, defeat and victory, of the spreading exuberance of one individual or species and the total effacement of another, in the economy of the unified entity, the life-personality, which so many considerations would lead an unbiased observer and reasoner to accept as truth? On which side is its justice? Is it at all possible to conceive any common psychation in the coexistence and co-consciousness of two living beings who must engage in a mortal struggle in order that one may survive? What can be said of the interpretation of life which sees unity behind such disunity, harmony behind such injustice?

In man there are also the social and emotional parasitisms in which so many human beings live upon one another, even to the point of complete enslavement. Among all the living, man suffers most because he becomes more keenly conscious of these cruel dissensions with his kin and kind. Not only does he have borne in upon him the whole panorama of the utter wretchedness of animal life. There is also borne in upon him the ultimate futility of his own suffering in the conflicts which divide and destroy his fellow creatures. Even as the spiders spin their gossamer threads to trap their hapless fellow insects, the crafty, the shrewd and the strong victimize their fellow human beings, the clever prey upon the dull and weak. As ruthlessly as the animals and plants behave in their relations with one another, it is among mankind that there are attained the extremes of individual competition. These, from their lightest to their most loathsome parasitic or lethal aspects, fortify a million times the doubts of unity of constitution and purpose generated by the rest of the varieties of life. The idea of a life-personality seems to become but a shadow of delusion when confronted with these actualities.

Of all beings, man seems most obsessed and dominated by the impulses and instincts of separation and disunion, of aggression and destruction, as well as of the accompanying isolation and loneliness. As the most superior intelligence incarnated in the womb of protoplasmic potentiality, he might have been expected to give some recognition to the affiliations of his origin. But, alas, he writhes in torments like

those of any other creature, accentuated a million times by the achievements of his superior brain. Beyond all comparison are the horrors and tortures, the slaveries and parasitisms he has inflicted and continues to inflict upon all the living world as well as upon his own species. The same lack of mutual understanding, identification and solidarity that is common in every other form of life composes the very essence of the fragmented disunity of his consciousness. Of all creatures, he is the arch destroyer and the supreme war maker, the ruthless conqueror and assassinator of all that stands in the way of his individual desires and greeds and passions. The will to aggression, to inflict pain and death upon all that will not yield to him, or subordinate itself to his uses, is the outstanding motive of all his activities.

The historical record provides a portfolio of evidence that illustrates how easily human beings clash, how difficult it is for them even to live together in peace and order. The codes of law of the first civilizations indicate the necessity of the cruelest punishments and the direst penalties, to prevent or alleviate the preying of man upon man. To check their ruthless aggressions, every possible resource is resorted to by rulers and conciliators—such devices as working upon the imagination by religious teachings, exhibition of the legal suffering of the penalized, tutorial indoctrination and conditioning. But nothing seems able to lessen somehow the feral quality of the solitary beast who clenches his claws against his kind, and do not touch the underlying impulses of men to vent their sense of isolation in conquest and oppression.

4. RECONCILIATION OF INDIVIDUALITY AND COMMUNITY

It is true that a certain order in human association has been achieved. The regularities of every civilized community are indeed a miracle of accomplishment, for they are based upon the suppression of most deep-seated drives of mutual destruction and of individual assertiveness. The presence of individuality in life, and its significance for the struggles and conflicts of mankind, inevitably produces these contradictions and inconsistencies in the collective life-personality. The meaning of individuality is one of the supreme questions with which the human species must cope in its effort to understand itself and its relations to the whole of things and to the whole of life.

If mankind is ever to feel itself and see itself as an integrated organ of the life-personality of whose existence we have assurance from so many different sources, the paradoxes and antinomies of its fragmentation in individuals must be faced. Many times in the past have the

claims of individuality to paramount reality been examined, challenged and limited. Yet no satisfactory allocation of its status in the life-personality, the living entity regarded as a complex unity, has ever been objectively attained. Is it at all possible to understand how the functional position and needs of the individual can be balanced against the inclusive collective personality? Certain characteristics of individualities can be reconciled with their apparent opposites. For there are available a number of instances of inclusion of co-ordinated individuality and collectivity in the same unified structure, from both the inanimate and animate worlds.

All machines, constructed of interacting and interdependent parts, illustrate a simple co-ordination of self-contained parts and a complete whole. In automobiles, for instance, the carburetor and the differential, the tires and the wheels are separate entities, capable of existing in themselves, with a certain quality of individuality of form and function. To fulfill the role for which they have been designated, it is essential that they be placed in the proper relation to the other parts when the automobile is assembled. The diverse parts then come to possess, in addition to their actual and potential individualities, a realized collectivity of form and of function. Impossible to conceive of the one without the other, of the emergent function without the participant form, in short, of the collectivity without the individuality. Yet a certain degree of mechanical friction between them is inevitable. This would correspond somewhat to those attritions between organisms which are the by-product of individuality in the living world.

Within living organisms themselves, self-contained systems as they appear to be, are found the most subtle and extensive co-ordinations and interactions of individualities. Every multicellular organism represents the adaptive collectivization of the properties and potentialities of lesser and simpler individuals for the more inclusive purposes of a higher, more complex individual. All the higher animals and plants, the metazoa and metaphyta, are constituted of those units of life, those self-integrated patterns of protoplasm, the cells. These, the units of metabolism, possess an internal unity of structure which makes them, recognizably, true individuals. Yet they combine their individuality of form and function to contribute to the making of what is recognizably a single higher individual.

The number of cells in an organism may range from a very few, as among the lowest cell colonies, to the many billions present in the body of an elephant or a man. All the tissues of the body, the liver and kidney, the muscles and the spleen, the brain and the glands, are built of these corpuscles of living matter, alike in many funda-

mental matters of chemistry but specialized in others. All of them in the higher organisms have emerged as a result of the fertilization of a single cell and the subsequent dividings and subdividings, the multiplications and modifications of its original substance and potentialities. They may then be flattened or cylindrical or cuboid or spherical, colored by pigment or transparent as glass. Every organ of the body is an organized aggregate of these differentiated cells. In all the varieties of their final shapes and performances, no one can deny the existence of these vast populations of individuals, their common origin, their common protoplasmic constitution, their community of interests and their common destiny in that which we designate as Tom Jones or William Shakespeare, a sea lily or a snail.

5. CELLS AS INDIVIDUALS AND SUBORDINATES

Each cell has its own life and lives it. It breathes, feeds, excretes, grows and shrinks with time in its own way. Microscopically so small as to appear as quiet as a seed, it is never still. A perpetual urge of movement either rapid or slow and almost imperceptible produces a continuous change of shape in the cell. Each is, as it were, constantly asserting its individuality and its independence. Yet among the higher animals, even the simplest cells, the apparently self-centered units of the organism, are dependent upon the circulating blood for their life-giving oxygen and nourishment, and also for their sanitation and survival, for removal of the noxious and unwanted products of their own metabolisms of which they must be constantly cleansed.

Blood itself is a prodigious collection of cells. A floating tissue, indeed a floating organ, it carries billions of red pigmented cells, bearers of oxygen, and millions of white cells, protectors and defenders of the tissues against foreign invaders. Each red cell is obviously an individual, breathing and feeding, changing its shape momentarily from a sphere into a disc and from a disc into a cup. Each white cell is like an amoeba. It sends out its feeling pseudopods, testing whatever it comes in contact with, and giving battle to all that is alien and unaccustomed. It may wander from its own liquid medium, the plasma, into the tissues, such as the skin, to attack and destroy what should not be there, whether it be a splinter of wood or a nest of bacteria.

Red cells and white cells of the blood, because they are free and floating nomads, produce a most convincing impression of individuality. But the other cells, the cells of the fixed organs, such as the heart or liver, are also relatively free and independent individualities, for they may be separated from the body and be kept alive away from

it, provided they be properly nourished and bathed in a suitable culture medium. The cells of a tiny bit of the heart of a chicken have been thus kept alive for so many years that the cardiac particle which they compose has outlived more than the life spans of three generations of its kind. A single cell may be detached from such a tissue culture and may be kept alive indefinitely if it is placed in blood serum which is renewed every few days. It acts like an individual from every point of view. It sends out extensions of itself: it enlarges and even reproduces until, from a single cell, a colony composed of a number of such cells is generated. Such an isolated cell will continue to function in its own special way: for example a thyroid cell so cultured will produce thyroxine, its specific internal secretion.

In many respects the cell presents exquisitely the characteristics of individuality in organisms. It possesses a certain autonomy, that is, it lives within itself, and primarily to maintain itself within the very organism from which it is derived. It is truly an integrated system, for if any part of itself is cut away the cell will re-form that part, provided its nucleus has been left intact! In fact, its nucleus, as its synthetic center, can reduplicate, out of the material of nutrition, another cell which itself is autonomous. The nucleus of the cell is the source of the chemistry which makes it a self-sustaining organization.

When it lives alone, in a culture medium, the cell of any organ or tissue of the body will behave like an amoeba, paramecium or any one-celled self-ruling and self-regulating member of the protozoa. But when it is placed in the body, in the particular tissue and the particular organ of which it is a constituent, it behaves like an entirely different creature. It is then governed and disciplined by the needs and relationships of its fellow cells in what is called a *consensus partium*. It does not wander about as it likes: it does not reproduce itself indiscriminately: and it does not grow or change its size or shape except as it is producing a secretion or engaging in a function beneficial to the organism as a whole.

When located at their functional posts in the body, the cells unite their individualities for the collective good. Every activity of a human personality, the beating of the heart and breathing of the lungs, the pulsations of the arteries and the contractions of the muscles, the secretions of the glands and the psychations of the brain, represent the sum of the correlated functionings of these co-operations of the cells. Each liver cell, for instance, manufactures and delivers a drop-let of bile. The manufacturing chemistry of millions of liver cells is pooled to make the quart or so necessary for each act of digestion,

just as the contents of a honeycomb represent the totality of countless minims contributed by the individual bees of a hive. When muscles contract, in the speediest movements of a tennis champion or the heavy heavings of a longshoreman, the effect is achieved as a whole by the properly timed symphonic co-ordination of regiments and brigades of muscle cells which have contributed, each in its tiny way, to produce an effect which seems as instantaneous as the flash of an ignited charge of gunpowder. The total life of any individual is the outcome of the harmonic orchestration of all of the cells of his body playing together as if conducted by a master.

The cells, the blood and tissues, thus offer perfect examples of the collaboration of individual form and autonomy with collective function and co-ordination. Irresistibly they remind the observer in many ways of human beings who, defined individuals though they are in a number of apparently irreconcilable ways, must live together and for one another. In the mass and from the perspective of a single life history, the cells of such an organ as the heart create the impression of a single entity. But there can be no doubt that each heart cell belongs to the heart of an individual. And each heart cell has its cycle, of birth, maturation, wear and tear, senescence and death long before the possessor of the heart completes his cycle.

There are many other similarities between the generation and dissolution, the life and death of the component cells of organs and the human being which together they constitute. A red cell of the blood, for example, runs through its cycle of existence in ten to thirty days. It lives during that time solely to transport a given number of molecules of oxygen and carbon dioxide back and forth from the lungs to the heart and from the heart to the other organs by means of its hemoglobin. So about once every month the entire population of red cells of the blood is replaced by new individuals mobilized from the bone marrow where they have been born and gone through stages of infancy, adolescence and maturity. The old and dead, worn out by repeated functionings, are filtered out into the spleen which is at once their slaughterhouse and graveyard, for within it their fragments are digested by the local white cells which carry away what is left of their hemoglobin to be used over again for making new young cells.

And the white cells themselves live entirely but from a month to a few months before they too die and disintegrate, in their turn to be incorporated into the substance of their younger, more active colleagues which devour them like cannibals. Throughout the other organs of the body, excepting the brain, all the cells grow old and

degenerate after they have functioned for a time. And they, having reproduced themselves, give way to those they have reproduced, the last remnants of their protoplasm serving as food for the newborn.

No one can fail to follow the implications of these resemblances between the history and fate of the cells, the lesser individualities constituting the large individual who is a self-conscious human being, and the individual plants and animals which are the constituents of the largest individual of all: the life-personality. The living microscopic cells, each in itself unique and self-subsistent, are united as the sub-personalities of the inclusive personality who is their carrier. These, in turn, constitute the larger cells, the micro-units, more loosely connected to be sure, and more freely circulating, yet the parallel parts of that most tremendous of all organisms, the life-personality which embraces them all in its career and evolution. It took a microscope to establish the existence of cells, and their relationship to the apparently homogeneous tissues of which they are parts. It requires a sort of psychoscope to show the true relation of our individual selves to the one and only life there is, of which science is the prophet.

6. THE DILEMMA OF LIFE

The brain, the master organ of the body, its center of control, is different from the other tissues in that its cells do not replace themselves and die, but remain fixed in number and functioning progressively throughout life, except in so far as accident or disease may destroy some of them. Because of their special characteristics, these brain cells, the neurons, of which there are billions, are connected with each other by filaments or fibers which work like drawbridges in that they can make connections by the establishment of contacts or can be withdrawn. For they are projections of the surface of each individual cell, retractile or attachable to its neighboring cell, like a tree that may interlock its branches with the branches of an adjacent tree.

The brain is a web of individualities because it is a network of neurons which are cellular entities, each of which is possessed of a certain degree of self-government and regulation. Yet out of this intercommunicating and interacting conglomeration of individualities there emerges the unified flow of psychation which registers and acts and knows itself as a unique consciousness, the individual self or ego, which does not even suspect, by direct awareness, the existence of the cellular sub-personalities which make its existence possible.

The naive ego regards itself as a whole in itself, completely different

from and unidentifiable with any other consciousness, or with any of its constituent smaller protoplasms. But science has taught us its composite character, and the co-ordinated co-operations which alone make it possible. Every human brain, the carrier of individual consciousness and the unconscious, is thus a configuration of many subordinated sub-personalities. It is a community of these sub-personalities, a vast assemblage of subindividualities, which live, each for itself, in every sense of the word. But they also live for one another, since they function for the collective whole, for the superindividuality which feels itself as one indivisible being, and must somehow preserve and maintain itself as such. Its sense of self-identity as well as of its organic integrity, and the necessity for its self-preservation against the attacks of a hostile or indifferent environment, are completely dependent upon the co-operative contributions of these lesser individualities of which its consciousness was unaware until science discovered them.

The conviction of the naive human consciousness that it is indubitably and unquestionably a single entity is understandable by anyone who watches the smooth, harmonious working of the body—. This delusion might never have been dispelled. But when the power of their eyes was magnified by the invention of lenses, the labors of a series of biologists demonstrated the contradicting actualities behind the seemingly self-evident fact.

That we are members of one another as parts and organs of the body are members of one another was early suspected. There was the parable of the struggle of the members of the body, of the dispute among them for supremacy: of the claim of the feet to be the masters, since they sustain their possessor and carry him to all that he desires, the counterclaim of the hands that without them such movement would be useless, the assertions of the stomach that without its digestive powers the being would die of inanition, the just claims of the heart and lungs and the vital centers of the brain. These analogies mitigated somewhat the disastrous effects of the illusion of an indivisible and isolated body and mind as the background of individuality.

But it was the discovery and investigation of those microscopic blobs of living matter, the cells, which are the actual units of our existence, relatively independent yet so integrated as to create the functional singleness of personality, that opened the eyes of mankind to the true extent of the fallacy. That discovery belongs among the most important gifts that scientific research has presented to the commonwealth of immortal ideas with which our psycho-reality functions. Not only did it demonstrate that we are made of the same underlying

stuff and built along the same lines as all living things, but it also proved the fundamental unity of all life and established the model of collective co-operation. In its synthesis of the forms and functions of cells has been reconciled the paradox of the simultaneous coexistence and co-consciousness of the one and the many, of singularity and multiplicity, of the union of the countless localized and focalized individual lives and the profound and sustaining unity into which they coalesce.

And then there are the transitions between life and nonlife, between that which has the powers of a living thing under the right conditions and that which is bereft of them under other conditions. The cells are the active sub-personalities of our personal selves. But they are not the last word, the ultimates in the subdivision of individuality. For just as the atom, the unit of elementary matter, has been broken into and discovered to consist of such lesser units as the electrons and protons, there have been brought to light subcellular units such as the genes and viruses. The genes as the carriers of hereditary qualities and the viruses as the causes of certain manifestations of life, malignant or beneficial to other organisms, represent units of protoplasm reduced to the lowest possible denominator.

Some of the viruses have been crystallized by chemical methods. They are proteins chemically, and physically they are macro-molecules, the largest molecules known, a million times the size of the hydrogen molecule, the smallest. These virus crystals possess certain of the specific characteristics of protoplasm, the ability to keep themselves organized and to organize dissimilar matter into the semblance of themselves—to grow and reproduce. How much psychic life belongs to them, whether they are capable of any kind of learning, memory and persistent direction of effort, remains to be determined.

It would seem that as they possess a specific organizing ability, ability to change other molecules of matter with which they come in contact into their own pattern, and so to reproduce themselves, that an underlying psycho-activity must be postulated within them. The genes and the viruses are of about the same molecular weight and chemical composition, and so it has been suggested that the first precursors of cells, such as the smallest bacteria, began as agglutinations of viruses. Such may very well have been the case. And some day, perhaps, we shall know the exact how and when of the transitions by which the cosmic psycho-activity became transformed into the chemistry of the viruses.

However, it still remains a curious fact that the crystalline virus

becomes activated only after coming into contact with something truly alive. These viruses then become destructive assailants, for they attack and destroy that which has activated them, producing diseases and death. The bacteriophages, virus-like organisms, assault and dissolve bacteria, which are only one stage above them in the scale of living organization. Yet they appear to have conglomerated like the genes of cells which work together for the good of the superior organization, best exemplified in the brain into whose dynamic pattern they have entered.

7. THE MEANING OF INDIVIDUALITY

There is really only one organism on this earth—life. Or as an organism of organisms, it should perhaps be called the superorganism. *In that superorganism there can be only degrees of relative individuality.* Absolute individuality is seen to be the greatest of illusions. And yet, since among all of its organisms, from the lowliest and simplest to the highest and most complex, there is war and destruction everywhere, there must be some reason, some necessity in the logic of the laws according to which the life-personality and the cosmic psycho-activity must work and by which they are limited. The law of entropy is only one law to which they are subjected.

Surveying the most diverse scenes of life, one cannot deny the ubiquitous and endless struggle between individuals for survival and domination, ruthless or subtle, apparent or secret. This hostility suggests, not the harmonious interactions of parts in a whole but of a fatally determined conflict between irreconcilable, fiercely self-preservative and self-protective beings. Yet the truth is that all individuals are not the sharply delimited entities they seem to be. For they are all the compounded emergents of an association of lesser parts of variable degrees of independence and isolation.

All the separate individuals of a species are now seen to be an organization working as a whole for far-reaching purposes in spite of an internecine war of rivalries and aggressions. Yet it would seem impossible to assimilate into a simple rational pattern the mutually destructive activities of the living. The conception of an underlying unity and continuity and identity of the life-personality throughout the course of its history has to be squared with the fact of individuality.

All roads lead in the end to death for the individual. And the episodes of the conflicts of his life are the inevitable incidents of his frictions with his environment, lifeless as well as organismic. In his

beginning as in his ending the individual is part of an order in which he is constantly interacting with other parts. As a machine wears out because of the friction of its parts, the individual, as a part of life, wears out because of his conflicts with its other parts.

The elimination of the individual, in the course of evolution of the species and the life-personality, is similar in every way to the dissolution and desquamation of the cells of the individual himself, like that of the nails, hair and skin, as well as of red and white corpuscles of his blood, which goes on continually in the healthy body. Where competition for food and reproduction goes on nevertheless, the refrain repeats itself that the conflicts between living individuals are actually quite different. The insistent spectacle of the struggle for survival, the duels for superiority and reproduction and their evocations of self-isolation cannot be dismissed as mere by-products of the life process. For these struggles stand out as striking and pertinent figures in the foreground of the picture. The paradox repeats itself: the individual, as part of his group, is caught in a fundamental conflict of motives.—As one in a group he has to act for his own interest and yet against it for the others of the group. This fact of war-in-life must be admitted to be at least as real and objective as life's co-operations and integrations. There may be an underlying psychic unity and identity of its parts, but their obvious material discontinuities and dissensions cannot be discarded as superficial or as illusions.

8. SPLITTINGS WITHIN THE LIFE-PERSONALITY

Analogies and similitudes between life as whole and life in the individual can be extended to include possible parallelisms of morbidity and pathology. As their nature is of the same order in so many other respects, with an identity of physical and chemical properties as well as those of consciousness and the unconscious, memory and organization, it should be expected that both would be subject to the same psychic diseases. It is a hazard of every collective configuration, of every complex system in which the co-operative pattern is established by an interlocking and intercommunication of contributive subsystems, that the laws of dissociation may affect them just as effectively as the laws of association. By a comparison with what may happen in the human body-mind when it is submitted to certain stresses and strains that result in psychic conflict and illness, disrupting the personality even to the point of insanity, there may be obtained insight into the pattern of individuality within the life-personality itself.

In a starving organism, its sub-personalities, the cells, are forced to compete among themselves for survival, for oxygen, for blood, for food in order to survive, function and reproduce themselves. Each of the organs attempts to obtain its due of sustenance, and each struggles stubbornly to appropriate its share, as if its needs alone were important and with no concern for the needs of others. Yet each continues to contribute to the maintenance of the whole in the very act of selfishly caring for itself. The brain, the organ with the highest metabolism which has the greatest need for blood, oxygen and food, remains best fed to the last and retains its dominance. An insufficiency of food, then, will lead to an accentuation of individual differences within the organism. When lack of proper nutrition attains a certain degree of severity, further analogies appear between certain of the cannibalisms and parasitisms of life, and disease in the body. This may be observed in the manifestations of cancer.

Cancer cells are proved to remain so indefinitely by transplantation from one organism of its species to another, or in the proper nutrient medium in test tubes. For having changed from the normal into the cancerous state, they remain changed. These cancer cells assert their individuality aggressively and rebelliously against the interests of the organism as a whole. Thereby they set up a struggle for existence within the body which leads at last to their own destruction, as well as to that of the other normally harmonious cells which they have attacked. In that struggle there is displayed a ruthlessness and destructiveness as chaotic and arbitrary, as violent and anarchistic, as mad and suicidal as the mutually injurious interplay of cross-purposes and cross-interests exhibited in the conflicts of the separate individuals of different species. A defect of nutrition, which changes the cell's chemistry, which in turn changes its appetites and drives, is what transforms normal cells into cancer cells.

But better than any other parallel applicable to the present status of individuality within the life-personality is that of its likeness to a multiple dissociated human personality, at war with itself, such as occurs in human psychopathology. In typical instances of the kind, human psychation within the same body has been shown to be capable of splitting into several different sub-personalities, each unaware of its bond with the others and with each having altogether contradictory personality characteristics. In such people the personality has been profoundly divided by discrepancies, inconsistencies and incongruities within the set of values by which the individual must adapt himself. As such an individual collides with incompatible needs

and desires, or inadequacies and insufficiencies of his constitution in relation to his environment, he splits his personality into several selves because he cannot harmonize the irreconcilables within himself into a single autonomy.

It is as if certain aspects or functions of the personality were forced to take on an individuality of their own. Thus personified, they seem indifferent to and even unaware of the personality as a whole, from which they have detached themselves. Yet they continue to belong to it, inseparably bound to it by the invisible strands of protoplasmic and psychic continuity. They are the well-known Jekyll-and-Hyde personalities whom Stevenson's story familiarized. But the contrast may be more than dual, for tertiary, quaternary and even more numerous divisions of the personality may coexist. Such relatively autonomous sub-personalities may emerge only in certain dream states, in periods of reverie, or they may erupt incontinently in outbreaks of irrational self-injury. There may even develop an amnesia, when the individual forgets who he has been all his past life, and another submerged personality which takes possession of his consciousness.

The subterranean existence of conflicting sub-personalities in the same individual may also be demonstrated by the methods of hypnosis. Indeed by means of hypnosis an independent autonomous personality in the unconscious may be gradually built up and developed.

It henceforth continues within a conscious personality that appears to itself, and to the outside world, single and well integrated.

Such cases of multiple or split personality have appeared and played amazing roles in magic, religion and art from the dawn of human life. Out of the single body of an individual with one name and background, periods or episodes of sustained and consistent feeling, thought and behavior have erupted which made him out to be an entirely different person who should really have another name to designate his singularity. It is as if a dominant personality were forced to abdicate, for a time, to another, hitherto restrained from self-expression or realization. The eruption into dominance of the repressed personality may occur automatically, under the influence of an unconscious psychic drive, or can be brought about chemically by the administration of certain drugs.

Among primitives transformation was looked upon as either diabolic or divine in its origin and meaning, a manifestation of magic. It was not until the scientific study of the unconscious began to make headway toward the end of the nineteenth century that these manifestations began to be properly evaluated. The power of various

motives and causes to divide the steady stream of psychation in even the normal was given credit for the bizarre contrasts presented in the most strongly developed examples of the phenomenon. When Stevenson dramatized that scientific discovery of his day in his famous double personality, Dr. Jekyll and Mr. Hyde, he created a figure of modern folklore. Dr. Jekyll, as the kind, generous, honorable physician, beloved by all for his philanthropic labors, could turn himself, by means of potions he had discovered, into a loathsome and criminal individual who called himself Hyde; and then, by another potion, into his older, socialized self. The conflict of the two characters in the same body has become symbolic of the universally recognized problem of every individual: the reconciliation and co-ordination of clashing motives and instincts in his make-up.

Clinical observation has demonstrated that two or more active self-integrating and self-regulating psychic systems, so disconnected and highly evolved as to be in effect separate persons, may coexist in one brain. Their concurrent existence is never known as such to the individual so afflicted, because he is unable to bear the emotional conflicts responsible for the diverse personalities. Characteristics of the dissociated personalities may be complementary or antagonistic—one may be energetic, self-assertive, extroverted; the other neurasthenic, submissive, introverted. With their different tastes and habits, they may have different interests and friends. Not only that, but the one may speak of the other as of a stranger, or even as someone actually disliked. The various personalities may not be able to communicate with one another directly, but one may write letters or notes to the other. Emergence and dominance of one personality may take place so suddenly that, in talking to a friend, the tone of the conversation may change entirely from one of close and friendly intimacy to the formal attitude usually adopted toward a slightly known acquaintance.

As within the framework of the single body, two or more human beings, as different from each other as human beings can be, can under certain circumstances appear and regard one another as disparate beings, unconscious of their underlying unity, so within the continuum of the life-personality, many differing and conflicting individualities have been engendered. As, moreover, by a suitable approach and therapy these disparate personalities can be made aware of their fundamental identity, so the constituents of the life-personality may be rendered conscious of their basic solidarity and unity by science. When such a consciousness of their underlying

genetic and psychic unity has been thus intensified, there may be dissolved the irrational emotional conflicts which have caused them. A reintegration and coalescence of the various rival and antagonistic personalities may then be achieved, in both the individual and in the larger superorganism of which he is a part.

9. THE NECESSITY FOR INDIVIDUATION

The logic of necessity would seem to have produced the general quasi-normal splitting of the life-personality into multiple individual personalities. The resultant sub-personalities have become completely unaware of the unity of their origins and of the bonds which bind them together into one whole with a single nature and history. All through the animal and plant world, it is the apparently healthy and flourishing individuals that behave as if they were much like the segregated psychic systems which impersonate isolated individuals within one body. But splitting of the personality may reach the point at which it is definitely pathological and threatens the life of the involved body in outbreaks which may even result in insanity. In the network of life the differentiations which have accompanied the progressive evolution of the powers of individuals may also have reached the point of self-uncomprehending madness and self-destructive lunacy.

When the devices and goals of human warfare are reviewed, who can come to any other conclusion than that some underlying disease of dissociation is driving the human species to inevitable dismemberment? And the individuals of many other species, and different species in relation to each other, behave more like autonomous split personalities in a dissociated brain than like the cells of a single organism. It is as if they were affected by a profound amnesia of the continuity of their blood and the unity of their underlying psychic life.

Among human beings these profound splittings of the life-personality have attained their maximum. The evils entailed in sundering the individual from the totality of life are only too real. The enormous range of human suffering and frustration because of aggression and exploitation testify to them as well as that of all subhuman life. These facts cannot be denied or volatilized by conceptual subtleties or even by any long-range perspective of the end results of evolutionary history.

Behind the facts of dissociation in the life-personality and its possibilities for psychotic pathology in personal individuality, there is a certain inexorable necessity. It consists of the inescapable laws

of conditions essential for the production and survival of separate organic systems which individuals are. It is possible to imagine that instead of taking the course it has taken, of realizing and evolving itself in materially discontinuous individualities, a certain gross, massive continuity and unity of all the living had been achieved by life, like that of cells and the body. But as soon as one considers the possibility, there become apparent the immediate, unavoidable and impossible consequences of such an association and co-operation. These consequences would have interfered completely with progressive evolution of protoplasm toward an organization that would control entropy.

In a one-celled creature such as the amoeba, reproduction of itself by regular splitting of itself into two must occur after it has reached a certain size as a result of feeding and growth. For to continue to live, it must first of all absorb sufficient oxygen from the atmosphere, by diffusion through its surface, to maintain the basic, vital oxidations which keep it alive. In order to evade death due to insufficient oxygenation of its interior, actually by suffocation, it must retain a certain minimum distance between surface and center. As the quantity of its protoplasm increases by the sheer increments of growth, it increases in size until its total volume is raised out of all proportion to the area of its surface, so that not enough oxygen can permeate to the innermost particles of living matter. To escape inevitable death by internal asphyxia, the amoeba subdivides, makes itself smaller, to reattain the balance between its size and surface.

An amoeba has to reproduce itself. It was able to build itself into the relatively huge aggregations of cells which compose the bodies of plants and animals only after ways and means had been discovered by protoplasm for the extension of its surface into the interior. This was accomplished by means of infoldings and tubings for circulation of oxygen and food. Multitudes of cells are thereby associated.

Suppose that all the living cells of our planet could cohere—all the billions and billions of them, all the animals, and all the plants, and all the human beings—into a tremendous single mass of living matter with a perfect circulation and food synthesizing system. What would be the psychic results? Such a colossal creation would have to possess an equally intricate nervous system and brain to hold itself together in the face of the attacks of the environment upon any part of itself. And under the conditions of our planet, with its constant changes of climate and weather, of food and feeling, assaults upon its sensitivity would be many and without surcease.

Life, then, as a single organism, would be consequently constantly bombarded by sensations from its environment. If injured, as it would be bound to be, at any point on its surface, destruction, imbalance or abnormality would spread everywhere from any of its sentient subdivisions. It would be continually preoccupied and obsessed by them, and so its primeval sensitivity would be stimulated and hypertrophied, to the exclusion of any higher faculty. Its psychation and consciousness would therefore remain perpetually enslaved by the material conditions of its existence and no progress would be possible in its struggle, eternal and continuous, with its basic enemy—entropy.

To avoid such psychic suffocation and limitation, therefore, a disintegration of life into manageable sections, individuals, self-regulating, self-maintaining and self-reproducing, with pain, suffering and death remaining strictly localized in bodies and organisms, was logically indicated and inevitable. Hence, too, the understandable obsession with sex, in which the mechanisms of reproduction and evolution are combined, by which death is circumvented. The accidents of temporary circumstance and ephemeral chemistry as they might affect the flow of consciousness and progressive activity for the life-personality are thus defeated. But the experiences and memories of all its individual constituents can and do remain stored in the psycho-continuum without the permanent disadvantages resulting from material continuity among them.

Individuality is an invention of life to cope with the intricacies of a complicated environment. Disturbances in the environment can occur without swamping the total psychation of the life-personality and its drive toward more highly organized, anti-entropic systems. Life is thus freed as a whole from preoccupation with the irrelevant partialities and the minor experiences of its components. As a result, a higher psychic complexity has been made possible and has in fact ensued at the expense of the simplicities of continuity and unity which might have been achieved. If the resultant individualities have thus been compelled to remain limited, they have thereby been able to fulfill their function in the whole more effectively. They have gradually succeeded in overcoming their vulnerability to conditions, and have adapted themselves to their environments in a way which would have been rendered impossible by any continuous co-consciousness in a single system of what was happening elsewhere and everywhere.

The mutations of evolution have been the consequents of individu-

ation and will continue to be. Only in individuals can the necessary experiments in higher and higher forms of organization be carried out. Nevertheless a psychic continuum of ultrahuman dimensions does incorporate all individuals and their experiences into the largest conceivable organisms, those of life and the cosmos. In the light of these considerations, the necessity of individuation can be comprehended and its analogies and parallelisms in the sub-individuations of the self-contained body can be visualized and comprehended.

Yet the all too evident facts of the dissociation of individuals from their homeland in the collective psycho-activity of life and the cosmos cannot be dismissed merely as delusion. In subhuman species the lines between the physiological and the pathological in such dissociation have become extremely tenuous. In certain places and at certain times, the scavenging or balancing functions in the life stream of species preying upon species, resembling that of the red and white cells in the circulating blood, assume the characteristics of minds undergoing disintegration. It is the dilemma of the life-personality: how to balance the absolutely essential value of individuation with the equally insistent demand of collectivity? Hitherto, in its evolution, whenever one has gained ascendancy, the other has declined; the exaltation of the one has meant the suppression of the other—one always moving toward the solitary-predatory, the other toward the inhibited-submissive. The group containing both types survives, but is static because of the arrested development of its potentialities.

In the human species, with its self-consciousness and its realizations of kinship of blood and feeling and thought among all individuals, these dissociations are not only tragic but, in the face of man's increasing brutality to man, have become starkly morbid. Human life everywhere is torn by hatred and destruction and exploitation, reaching an acme in war. The recognition of these dissociations, in all their multiform manifestations, has become the supreme problem of mankind. The reintegration of the separate and isolated egos of our species into a renewed consciousness of their continuity with the life-personality and the cosmic psychation which has always existed but has been lost sight of in man's struggles, has become a prime necessity. The problem of the highest possible differentiation of individuals within the group, combined with their greatest possible group consciousness and group service, remains forever to be solved. It is the chief function of the human psychation to solve it.

11

THE RETURN TO THE MYSTIC PARTICIPATION

IF AT THE PRESENT STAGE OF ITS EVOLUTION, LIFE EVERYWHERE PRESENTS the spectacle of a splitting and dissociation of its personality into alien and self-destroying subdivisions, is there any conceivable therapy for its collective schizophrenia? Life as a whole exhibits many similarities to the autonomous complexes of the unconscious which may split and divide an individual human personality into multiple sub-personalities at war with each other. It looks as if we had come to an impasse in evolution. Is it necessary to despair of a remedy for the disease or of a more hopeful prospect for the future?

Man is at last becoming aware of these tremendous cleavages in the greater personality of which he is a part. May he not, in the wake of his insight, discover some way to overcome this most degenerative and destructive of all diseases in himself and his species? With a clear realization of the potentialities of such dissociation which is frustrating and defeating the purposes of the life-personality, he knows that he must find some remedy, or be destroyed.

Some answer must be found to the questions raised by the dis-integrative forces and the destructive stresses and strains which are working to bring to man the death of his species and which are wasting the energies of the cosmic being which begot him. As the universal and recurring conflict is intensified with each generation and with each invention of instruments of exploitation and destruction, a climax is approaching. Human beings engaged, more recklessly than ever before, in the war of individual against individual, class against class, race against race, nation against nation, can only ring down the curtain on the drama with the extermination of the only species that has ever become conscious of its place and function in the universe.

1. HUMAN UNIFICATION

Everywhere the human species presents itself divided and torn by civil war and obsessed with the infliction of injury, torture, mutilation and death. Is there ever to be a truce, an armistice, a final cessation of this battle within the personality of the species? What treatment can be directed against this disease of disintegrative individuation? How can clashing personalities be brought to the realization of their fundamental identity and solidarity in their species, in life and in the cosmos, which will be like the return of reason to him who has been brought out of a miasma of insanity?

The process of individuation, the differentiation of individuals more and more conscious of their isolation within themselves, has led and is leading to a complete deformation and dissolution of that which once bound human beings together. Men have lost touch with what they have in common. In the achievement of the fullest development of their personalities as something apart from the collective group there has been increasing emphasis upon the unique peculiarities of individual faculty and capacity. This has been fruitful in the creation of the appurtenances of civilization. But it has produced an almost complete erasure of those similarities and participations which, in spite of physical and mental differences, compose the basic human pattern. Yet a basic pattern of psychic likeness, as of body similarity, does remain to make them all feel and act alike, as the study of the images of the ancestral collective unconscious has demonstrated.

The problem of human unification remains the problem of problems. Individuation has been of tremendous value in the forward movement of culture, in the broadest sense of creative invention and production. If the expression of individual difference, individual superiority and leadership, had ever been permanently hindered or suppressed, no progress of ideas, methods, habits or ways of living would have been possible. Human life would have remained forever at a relatively low level just above the animal.

Every significant contribution to civilization has been brought about through individual variation and inspiration. The man of genius, the exemplar of creative individuation, can have no place in a social group which forbids his efforts as a departure from the anciently accepted, collectively approved ways. That is why certain primitive peoples have remained at their archaic level of economy and living. They have not permitted the introduction of the innova-

tions and advances of the differentiated individual. They go without the inventions and discoveries that each one of them would have enjoyed if they had permitted and encouraged deviations that are not only allowed but fostered and encouraged in progressive communities. Civilization owes everything to the constructive work of highly individuated personalities. Common humanity has been well served by the uncommon man.

Individuation has also played an important role in those societies which, under a leader or co-ordinator, have been conquerors and enslavers of other groups. A forced unification of smaller groups into larger and larger groups, states, nations, empires, has thereby been achieved. By reason of the superior qualities of an individual variant, millions were compelled to accept the same religion, the same laws, the same customs, the same language, the same traditions, the same symbols of authority. Co-operation was accomplished because one differentiating individual—the chief, the general, the king, the emperor—was granted or gained for himself and his followers the greatest possible freedom for the imposition of his conceptions.

A certain temporary unity was forced upon millions of subject believers through their acceptance of a set of new values. Thereby was produced such a society as the Roman Empire of the second century, the Mohammedan world of the eighth century, the medieval Europe of the twelfth century, precariously united and prospering for a period of time. Conditioning, education, and indoctrination of the young were attempted as a means of making the new order seem natural and inevitable for the immediately succeeding generations. Should we hope for the restoration of some such condition?

It is a historical fact that such a compulsive concord of the minds of men has had no enduring vitality. It was bound to disintegrate because the limitation of the aggression of individuality was only repressed, not controlled. Like every repression, it was destined to break out explosively in a repudiation of the repressor.

In European civilization, there has been a progressive emergence of the individual ego. The individual psychic life was enriched by the discovery of new lands and new continents. The recovery of old cultures and ancient civilization, the rediscovered vast accumulations of forgotten or lost arts and literatures of the past also acted as catalyst for a new protest against the imposed collective uniformities of belief and behavior. Finally the emergence of systematic science as the touchstone and tester of accepted truth paved the way for those wars and revolutions which represented the

resurgence of individuality over the claims of collective coherence.

Religious protestantism was only one of a number of challenges which culminated in the English, American, French, Russian and German revolutions of recent times. Though these are regarded as mass movements, reflecting the undertow of economic, political and social forces, there can be no doubt that it was the resurgence of individuality behind them that paved the way. The pioneer of ideas has preceded every collective breakdown or rebuilding.

There is therefore much justification for the apotheosis of the value of individuality. For individual quality, individual ability, individual initiative, individual talent, individual endowment have brought about new developments and improvements in the realm of both thought and technology. However, in the wake of this constructive use of individuality came the worship of it as a fetish. There followed a gradual dilution and final disintegration of the collective bonds and linkages which once provided the very foundations and standards of every life. The hypertrophy of the ego has terminated in its splitting and dissociation from the collective source of its power.

As a result individuality seems insanely bent upon its own annihilation. The same personal differentiations which have constructed mankind's most useful acquisitions and noblest ideals have also generated those manifestations of greed and cruelty, sadism and masochism, secretiveness and cunning, the psychotic extremes of pride and injustice, which have pervaded and dominated humanity. And although these extremities of individuation may provide temporary triumph for the ego, they are now playing the part of the autonomous complexes and secondary personalities which erupt into the conscious rational mind for its ultimate undoing. The collective sanctions of behavior which have bound men together have faded in the preoccupation and concentration upon the individual self. The one fear that has become dominant is the fear of individual frustration, defeat or death.

A profound disturbance of health is involved in this excessive separation of the individual from the collective life. The vitality of the variants who emerge as leaders or dictators in internecine war only throws into relief the general process which splits and tortures different parts of the whole which is mankind. Within the depths of his unconscious, that is to say, in the innermost recesses of his soul, which is aware of the collective roots out of which it has been born and nourished in the past, the individual knows that he is divided. In his solitary moments he is afraid and sick because of the

refrain that repeats, within the nucleus of his being, unendingly, that he is pursued by destruction, since all individuality can and must be only temporary and transient when it is deprived of the common soil of its nutrition. He sees hordes deprived of their collective solidarity, driven like leaves before the wind, not individuals, they, but the ghosts of individuals. It is like a horrible dream, a nightmare of the unconscious. But it is only too real!

Men wander like predatory beasts or driven sheep when they have lost their anchorage in the unity of life. For no individual, however apparently self-sufficient, can exist in himself alone, just as no autonomous complex of the unconscious can be conceived as an entity in a vacuum. No matter how he has broken with his ancestral continuities and no matter how proficient in self-realization, he is haunted by a sense of being lost. For he has forsaken the enduring and higher order of personality from which he is derived.

Thus he is plagued by the feeling that behind every positive belief about himself lurks a gnawing doubt, and every move of his self-centered existence is a palliative for the instinctive need to return to the currents of the life-personality. No matter how adequate the channels along which even the most personally successful has directed his energy, the time comes when the stream of consciousness longs to flow back to its source. All individual effort then appears to be vanity of vanities. In desperation the soul cries out for its homeland. A nostalgia for return sickens every moment of its existence.

2. THE REVIVAL OF COLLECTIVE CONTINUITY

After the tortuous struggles of so many centuries man stands aghast as he views the dissolution of the confident expectation of unlimited progress that would bring utopia and the superman. Instead he discovers himself to be a disappointment and a failure, dislocated from his connections with the rest of life and faced with a supreme catastrophe of his own making that may wipe him out altogether. There is vouchsafed to him a glimpse of the vicious personalism which has cost him his ancient affinities with the life-personality and the cosmic godhead. In the loss of his deepest affiliations with his fellow creatures by the hypertrophy of his ego-differentiation he has indeed lost his very soul. How is he to regrow his lost connections with the whole of life? How is he to revive obliterated affinities?

To reintegrate his individuality with the collective existence he must recreate that psychic circulation which once connected his individual life with the life-personality. Thereby he can restore the

flow of his consciousness in that medium in which he can be both submerged and sublimated—the continuum of that personality which is life at its most inclusive. To see himself and to feel himself, to manipulate and master himself as part of that all-embracing and continuing unity of life is the most urgent task before him. Instead of living solitarily, one of so many minute scattered islands of consciousness, isolated in a lighthouse of the petty emotions and trivial ambitions of a merely personal existence, he must be made to perceive himself as the temporary extension into space-time of the huge continent of a single all-containing being.

No one can exaggerate the great need, the overwhelming need for the isolated individual to develop a co-consciousness of life as one whole. Now he must learn and relearn how to be permeated to the very marrow of his bones by a consciousness of his continuity with life as a whole as the one principle and the one personality of reality.

Individuality itself is life's invention and possesses a fundamental and essential importance in its dynamics. Individuals must come to realize that they, as the foci of a collective network, who know themselves only as persons, are really the transient but important experiments and elements of life-history. Their bodies and minds are condensed and concentrated units of its constitution which alone survives with any lasting integrity.

The manifold ties of substance and soul which connect humanity indissolubly with the rest of the living compels the conclusion that individuation is only a special and local differentiation within the all-inclusive body-mind of life. Each and every one of us is a unique modification of its being for particular purposes and ends, of which we, with all our limitations, may now catch a glimpse and perspective. We are only at the beginning of learning its meaning, but there can be no doubt that we must become saturated with it in order to continue to live. That truth of truths has to be stated and restated, reiterated and reverberated down through the corridors of every human habitation and from every housetop.

For ages, individuals here and there have reported certain super-normal experiences which have been regarded as essentially mystical. They were esoteric revelations of a sublime union of their lives with that of life as a whole embraced under a variety of aspects and names. So vivid, so forceful, so convincing has that experience of direct revelation been to some of these individuals that they have become centers of integration and contagion for vast numbers of human beings who have submitted themselves to its meaning as a basis for

religion or a religious doctrine. Those few who have attained immediate knowledge of their identity with all vital manifestations—through the shock of a unique experience or perception, one perhaps never again duplicated and inconsistent with all their previous and subsequent experiences—have often been so moved by it as thereafter to conduct all the affairs of their lives and solve all their problems in accordance with its implications. But those who have received it at second hand hold it as a belief to which they have given their vote of validity as a matter of consent rather than of conviction. These have been the majority who, sooner or later, if not from the very first, fail to put into practice the teachings to which they have been converted. So, too, they fail utterly to escape the dilemma of their individuation. There has followed no real transforming influence upon the actualities of their emotions, thoughts and impulses.

Humanity as a whole has never been permanently cured of the errors and evils, the illusions and hostilities of individuation by any mass conversion dependent upon any special revelation or supernatural ritual. So the universal problem remains: how to attain this necessary coalescence of the individual with that from which he is derived and to which he is functional and subordinate: with the life-personality as it presents itself in his fellow men and fellow creatures.

There can be no doubt that a tremendous, a transforming upheaval of perceptions and values is essential before man can be convinced finally and completely that he is only subsidiary and partial in the continuum of cosmic psychation and the history of the life which is its offspring. Only then will he turn the cruelties and terrors of his doubts and uncertainties, organized within the ingrowing walls of his limitations, into the emancipation of attitudes and emotions that fructifies mutual understanding and co-operation. The idolized goals of the individual world, the snares and delusions of rivalry and victory in competitive conflict, the cries of ruthless domination over inferiority, the restless calls of mean advantage and ruthless exploitation, will then be devaluated and discarded. They will be discredited forever as the driving ambitions of any life.

The individual and the life-personality may be envisaged as hammer and anvil. Under their impact protoplasm has been shaped into the most complex energy-concentrating organization in the universe. And that is the justification of individuality in all its varieties and diversities. Over and above all individuals, however, must be continually visualized the reality of the superindividual mind and the superindividual body of which every individual is but a cell. An

over-all identification of the self and the totality must be achieved as a prime fact of consciousness. So that when one individual injures another he will know that he is injuring that collective personality of which he is a constituent, and is, in effect, injuring himself.

By constant repetition it is possible to sink deep into every human being this knowledge that he is only a part of a greater whole in exactly the same way, and with the same potentialities, as the finger of his own hand, or the branch of the vine. Then he will abstain from destroying, frustrating or debasing others who are as much a part of himself as he is a part of them; as naturally and consistently as he refrains, so long as he is in a sane state of mind, from mutilating or damaging his own cells and tissues, his own property and interests. He will relinquish the impulses of aggression and the exploitation for selfish ends of those he sees are literally his own flesh and blood.

These conceptions of the unity and identity of all the incarnate personifications of life must be thoroughly assimilated both logically and emotionally by all of mankind. They must be made to penetrate into the depths of the unconscious. They must be repeated and restrengthened until they have become the dominant motif of the consciousness of every individual. Once these conceptions are diffused into every consciousness, there will flow out of them new customs and manners, new habits and new laws for every association of human beings. For every individual will then make the fullest obeisance to their meaning in all remembrances of his past and all plannings of his future.

He who fails to renew his kinship with life, who fails to remember his obligations to his fellow participants in it, or who breaks out cancerously and anarchically against them, must be regarded as one ill with a kind of amnesia, a disease of dissociation. He is an abnormal deviation who must somehow be returned to his senses and his reason and restored to his memory of who he really is and where he truly belongs. This must be regarded not as a serviceable myth, but as an indispensable truth, factually observed and logically demonstrated, reinforced by the ancient intuitions and visions of the first seers and now assimilated as the most fundamental and precious idea in the possession of humankind. It is now possible to see into and beyond the apparent plurality of all living systems and to behold the underlying unity of life and the cosmos as the literal truth of things.

The universe might have been a mosaic patchwork of separate parts. The contents of the cosmos might each have been different and basically unrelated to the others. Instead, many scientific observa-

tions have revealed the complete solidarity of life throughout our planet and the complementary continuity of life and the cosmos. Every individual must now accept these data as the very heart and core of the values of his personal existence.

It will not be enough, however, to accept these facts and concepts merely as rational, reasonable, sound beliefs. There must be contrived a sense of a direct, a quasi-physical connection between individuals, something like that of the arm to the trunk of the body. Then would follow a direct consciousness of attachment of one individual to the other members of his species as well as to the life-personality, a consciousness that would be felt as well as known. Such an intimate experiencing of one another, should it be established, would provide the essential background for the revival of lost vital continuities, unconscious and conscious, among human beings. That would be invaluable for the restoration of the health of the life-personality which they serve.

As merely intellectual entities, such ideas would have little or no influence upon the behavior of mankind. Before they can become effective motivations they must weave themselves into the deepest complexes and emotions, associations and radiations, in the psychic life of the individual. They must become embedded in the depths of the brain. Then, with more than logical sanctions and moral approval, and then only, will they become the most active, powerful forces in human life. Then they will act dynamically for union against disunion, for integration against disintegration, and for the progressive advancement of the pool of contributions by all the members of the human species to the defeat of entropy and to the furthering of the cosmic plan.

3. POSSIBILITIES OF INTERINDIVIDUAL ASSOCIATION

The unification of the human personality is primarily achieved by the filaments of the nervous system which weaves its cells into a common network. A co-operative intercommunication of all its cellular components is constantly at work in the body. Among the billions of cells composing it, each has its own unique structure, activity and function. Each possesses its surface of contact with other cells, and its surface tension which maintains its separate existence. They are all, however, connected and associated by the filamentous links and bonds which combine them into an integrated whole.

Between many of the cells, also, there are minute bridges or canals of protoplasm that act as passageways of communication between

them. Strands of continuity, flowing from one cell to the next, serve to convert the smallest single-nucleated cells into larger and larger multi-nucleated structures, making each cell of a group immediately sensitive to what the others are experiencing. Such an intercommunication of cells composes what is known as a syncytium. All cells of the normal, healthy body can thus co-operate successfully because they are continually sensing, acting and responding together to the environment through the unity of substance produced by the syncytium.

For the body of mankind could there be consciously created a similar interindividual syncytium? Is there any possibility of even imagining such ways and means of communicatory solidarity? By the establishment of what channels of conjunction could there be provided for human beings the bonds of an invisible yet recognizable syncytium that would make them feel themselves unified and participants in the larger organism of which they are individuated cells?

Now in the brain and nervous system, where the cells possess a higher type of consciousness and psychation—one that remembers its experiences and is able to retain and transmit its modifications under the proper stimulus—the syncytial kind of communication is replaced by another—that of the synapse. A synapse is a point of contact between two nerve cells by means of which a physiological and functional rather than anatomical and material continuity is produced. The branches of the neuron divide into numerous filaments terminating in buttons known as end feet, which can be applied to or withdrawn from the main body or branches of another neuron. There is thus fabricated a linkage of cells which is permanent but not fixed, which can be made or broken, much as an electrical contact may be made or broken. The cells possess more independence and a greater individuality than in a syncytial system but the potentialities of a similar intercommunication between them is always maintained and constantly employed.

The only cells in the body that are not in touch with each other by way of syncytium or synapse are the red and white cells of the blood, including the so-called wandering cells. These move and float about in the fluids of the organism practically independent, resembling in their freedom the activities of separate animals and plants and unconstrained human beings. Nevertheless, they always co-operate with the other cells through the effects of various constituents of the chemical contents of the blood, such as hormones. Will some chemical or hormone some day make easier the transmission of telepathic continuity among human beings?

Another kind of communication reciprocally beneficial to the participants has been actually worked out between certain varieties of organisms. A close partnership of two species is thus evolved which has been named mutualism. It is the remarkable process of co-operative living or symbiosis, in which two organisms, each with its own individuality, live in intimate contact, exchanging materials and services. The partners in such an arrangement are known as symbionts.

Symbiosis has existed between plant and plant, between plant and animal, and between animal and animal. Such organizations occur, for example, among the lichens, those plants that creep and grow over rocks and trees, coloring them green, gray and yellow. Though seemingly a single organism, they consist of two kinds of plants, algae and fungi, physically and metabolically interlocked.

The lichens are really compound organisms which thrive in barren and forbidding places because of the advantages of partnership. They flourish luxuriantly in the tropical jungle, and range as the sole inhabitants of Arctic and Antarctic rocks and mountain heights far above the snow line. The partnership is one that has been forced by the fungi upon the algae, which they have captured and caused to become adapted to the advantages of their co-living. Under a microscope the lichen is seen to consist of little green cells, carriers of chlorophyll, entangled in a meshwork of colorless fungus threads, the molds, which have caught them in their web. The algae, because of their chlorophyll, can manufacture sugars and other substances in the presence of sunlight, food which can be used by their host-companions. In their turn, the latter supply moisture and mineral salts. Though the lichen fungi are the senior partners and gain most from the arrangement, they are completely dependent upon their commensual slaves and cannot live without their co-operation.

It is difficult to imagine the kind of psychic life proceeding in such a double organism. Where coadaptation to the environment has become so complete, some sort of psychic interchange must occur with the physical and chemical exchanges. Similar considerations apply to the numerous examples of symbiosis where a fungus has entered into close and profitable partnership with the roots of oaks, pines, orchids and heather. Sometimes, as in heather, the fungus partner proliferates upwards from the roots through the whole plant, through stem, leaf and flower, even invading the seed. In the roots of leguminous plants such as peas, beans and lentils, tubercle-forming

bacteria become symbionts capable of fixing the nitrogen of the air for the plants, which return to them fixed carbon.

Many such mutualisms of coexistence are extant in the living world. Though they are primarily dependent upon complicated physical and chemical adjustments between the two creatures, there must also exist a psychic rapport as well as a physicochemical adaptation between them. For they do not endeavor to poison or destroy each other, nor will they tolerate other contacts. In the case of the hermit crab and its sea anemone, for instance, the partnership is one of protection exchanged for food. The shell of the mollusc housing the crab is covered by the pink animal-flower. When the crab moves into a larger shell, it carefully transports its partner to its new home. The anemone, by means of its stinging nettles, protects the crab from attack by enemies, while the crab feeds its partner with its food remnants. Without resistance, the sea anemone permits itself to be detached from its shell by the crab when the latter decides to move into another home, but it will resist vigorously any other animal which attempts to disconnect it. Though the presence of psychic symbiosis in addition to the material symbiosis in these interactions cannot be proved, its existence is more than probable.

4. PSYCHIC SYMBIOSIS IN HIGHER ANIMALS

That a psychic symbiosis is at work among higher animals is indicated by the habits of the earliest colonial animals and the social and herding animals that appeared later. Insect states, such as those of the bees, the wasps, the termites and the ants, are co-operative societies, organized for a common life, including the storage and distribution of food as well as reproduction. They consist of individuals who are physically discrete and move about with apparent independence. Yet each one plays a specialized role in the whole organization comparable to that of the cells of an organism.

In an ant colony, for instance, specializations of structure make of its members ventable technicians. Together they work in groups constituting its organoids, for they are like the organs of a body. Some have large grinding mandibles for masticating corn; the jaws of others are leaf-cutting scissors; and others have bayonets for penetrating the heads of enemies. Each behaves as if attending to its own business, and its own business only. Yet through them the ant community is maintained in its characteristic social, economic and psychic life by fairly fixed instincts operating through discriminating senses of touch, smell and sight. At certain times of danger

and difficulty, or when there are occasions for co-operation, however, the members move and act as if they were affected by a common collective consciousness and common collective will. A distributed co-consciousness seems to pervade the hive or anthill. Such diffused co-consciousness has been called the "spirit" of the collective organization or the compound organism constituted by these insects. In the behaviors of the beehive or anthill observers have been reminded again and again of the likeness between the cells of single organisms and the individuals who are the super-cells of these compound organisms. Something spreads through the colony of related beings which holds together their various brains and nervous systems and makes them act as a whole, though there are no obvious tangible material continuities between them.

Each of the participants in the particular elaborated insect system possesses an independence of movement as well as a distinct individual structure. Yet each contributes to the preservation, welfare and reproduction of the whole in ways that remind one irresistibly of the specialized cells and tissues in our own bodies. They remain bound, from birth to death, to the central matrix and focus of their derivation just as do the sixty trillion cells of the human organism. And although they may range along a larger periphery in their wanderings, like simple cells, they remain subject and subordinate to the collective psychation of their organization, their activities constantly converging for the common good, with the same constant sacrifice of individuals to an underlying communism. And in the darkness of the colony's design, the blindly striving constituents are relentlessly driven to efforts and ends they cannot see nor understand. The spirit of the communal personality, the "spirit of the hive," carries on its work in a way remarkably similar to that of the unconscious in the human body. Yet no one knows where it resides or how it is able to follow and keep in touch with the order, or any disturbance of the order, of the hive.

In the collective maneuverings of herds and packs of gregarious animals and in the co-operation of flocks of birds in their migrations in response to the need for a new food supply, there are intercommunications of the members of the group that resemble symbiosis of the hive and ant colony. Such was probably the original method by which members of a social species communicated with one another and understood one another. Communication by means of distinctive signals developed later as the sense organs became more acute and precise. Indirect individual-to-individual methods of psychic inter-

action then appeared. But under stress, particularly the stress of the most ancient instincts of survival, a diffused psychic transmission of feeling and direction is reawakened. Something like it has also been observed among domesticated animals such as dogs and horses under similar conditions. This has been called synchronism.

5. PSYCHIC INTERCOMMUNICATIONS AMONG PRIMITIVES

We may not admire the unprogressive rigidity of the social structure of the bee or the ant but we can strive for the restoration of the co-consciousness of their colonies within our own communities. Among primitive peoples psychic symbiosis seems continuously active. As a result the evolution of the ego and the intensity of individuation among primitives are sharply restricted. The primitive's sense of his own psychic separateness is kept at a minimum. So much of the activity in his group is carried out in common that his mind is constantly held collectively oriented. His vocabulary and his habits, his moods and attitudes, are all dominated by what is really a psychation in common which makes the workings of his mind appear to a modern human being, as irrational and incomprehensible.

Because his thinking is regularly conducted not along the lines of individual but of group feeling and imagery, he lives dominated by certain ideas and symbols which the French sociologist Levy-Bruhl has termed the "collective representations" of his experiences. These ideas are always saturated with emotion, for primitives seem to associate all their perceptions with attitudes of fear, reverence or love. Consequently they fuse their own consciousness with the concrete contents of the environment, drawing no line between the subjective and objective.

To primitive peoples the contents of the environment do not have any single nature, unique and self-subsistent, as modern civilized man sees them, but a dual or multiple one involving an individual and collective relationship at the same time. To them, any human being may be at once a man and a werewolf, for instance, because both are animals and have an animal nature in common. They always feel and sense themselves collectively as well as individually and they believe that other individualities do the same. If, for example, a lion or leopard has been hurt or killed, all the other lions or leopards in the world have been affected and have experienced something of the hurt. Individual personality as something completely set apart, wholly alone and confined within its own limits is inconceivable and incredible to primitive peoples. And this they believe not as an

intellectual conviction solely, but as a direct presentation, an immediate intuition of their psychic life as they live it daily. A symbiosis of minds as well as of bodies is to them the natural and obvious way of things. It functions because some primeval property of intercommunication between all living things is still available to their psychic powers. It would seem that this power was lost or atrophied when ego-differentiation and its concomitant, an extreme logic of individuation, became the means and ends of civilizing culture—the price paid for the enormous gains of individual variation and creation.

Because they live under the conditions of psychic symbiosis, it seems patent to primitive peoples that there is only one reality, which is universal and endowed with all properties. This reality they call *mana*, a universal power-influence, permeating the air, the earth and the sea, and capable of transforming itself into any object, plant, animal or person. Any number of metamorphoses of it are possible and always occurring. As he imagines himself as well as everybody and everything else that he knows to be only a crystallized or precipitated form of it, the individual always takes collective psychation and communication for granted.

Among these primitives something like the spirit of the hive functions as the spirit of the tribe or group and is articulated by them in their language and attitude toward the conception of individuality. Much in their beliefs and practices can be put down to unsound and uncritical reasoning, a lack of adequate information and a consequent unrestrained association of analogies and similarities. But a certain residue remains which suggests a projection of the individual's psychation into his total world and an extra-sensory communication with its manifestations. Thus he imparts and receives a certain type of knowledge which is diffuse and collective in character. It is knowledge which has not been acquired by any effect of sensory perception or logical method. Rather does it seem to have been arrived at by movements along the lines or grains of a continuum, with unconscious contact along invisible directions like the lines of force in an electromagnetic field.

The primitive thus feels a certain interplay of psychation between himself and other animals which is like that displayed by the wasp in providing for its offspring. There are species of wasps which deposit their eggs in the bodies of living spiders, caterpillars, and other insects. The female of the species accomplishes the paralysis of the future host by means of a sting or ovipositor perforating the victim destined to provide the larva with fresh meat. It is desirable that there should

be paralysis rather than death, paralysis that will continue for the number of days it takes the egg to hatch. The wasp stings its prey into immobility by penetrating the point where the motor ganglia, controlling its movements, are situated. In so doing the wasp displays an anatomical knowledge which it certainly never learned by dissection or by any process of trial and error. Primitives feel that they can affect or be affected by all the contents of their environment in the same way. Hence they believe that they have something in common with all living things, with the plants and animals around them.

No matter how different in outer appearance, all are products and aspects of the same essential, underlying reality of things. The presence of mana in them can be tested by their energy content and their power to do good or evil. Mana, moreover, is in a condition of continuous flux and change, involving the forms of all beings, their activities and metamorphoses, their life and death. Thus they see a basic oneness in the different varieties of objects, animate and inanimate, for mana permeates and dominates all of them. It includes all the psychic as well as physical potentialities of the earth and the universe.

As a result, the members of primitive societies possess a curious feeling of unity of life among themselves as well as with their environmental plants and animals. A feeling of intimate relationship links each with all his fellow creatures, with the innermost powers of all creation. The outer form means nothing, since shape and size are mere appearances or temporary manifestations of mana. So men and animals may impersonate one another interchangeably, either as a whole or in part. These conceptions dominate their thoughts and feelings, or rather their compound thought-feelings, which they never separate. And in their art, in their cave paintings of animals seen as well as those imagined, in the sphinxes and chimeras, the griffins and mermaids and the other fantastic conjunctions of human and animal, there is the same recurrent note of the mystic participations, mystic in the sense of orientation to invisible forces and influences as real presences and effective agents of the universe.

6. THE PRACTICE OF MYSTIC PARTICIPATION

Eliminating irrational fantasy and the vagaries of anthropomorphic thinking, something remains in this mystic participation of the primitive with all of his kind—and indeed with all psychation—something important that cannot be analyzed away as utterly unreal, merely mythical and obsolete vestiges of the infantilism of the human species.

One of the essential differences between the psychation of primitives and moderns is due to the critical attitude that the latter have assumed toward the immediate effects of the laws of association. The associations of perceptions and ideas in the modern mind are much better controlled. The primitive's mind may be described as a much more unhampered, uncontrolled sphere of association, which permits sequences of cause and effect, affiliation and interpretation that logical reason cannot tolerate. Nevertheless it may be that the very receptivity to free association of the primitive allows entrance into his psychation of beams and waves of information and intuition which are lost upon the more insulated ego of his descendants.

The primitive makes no significant distinction between the one and the many, the individual and the group, the specimen and the species in any animal or in his own family or tribe. It is typical that he speaks of the bees as the bee, the wonderful manifestation of the universal mana which can produce wax and honey. The bee is not this or that particular honey maker but a special case of the species as a whole. All individuals are simply multiple and transient expressions of an imperishable essence. The identification of the individual with the group extends into all that the primitive sees, feels, thinks or does.

As the predominating elements of his consciousness are collective in origin and function, conformity of belief and behavior follows inevitably, since the individual comprehends his life only as that of a member of his social group. As logical derivatives of this attitude, many curious practices and customs seem as rational and natural to primitive peoples as their contraries appear to the civilized. What touches one touches all, literally and directly; what belongs to one belongs to all; what ails one, ails all. If one is taken sick and is put on a diet, not only the patient but also his relatives and the others of his tribe must follow the same diet. A general fast may be prescribed for all his kinsfolk if he is wounded; and if one of them should partake of food, it is considered the same as if the patient had broken his fast and made his condition worse. He employs the first personal pronoun in telling of collective matters of all sorts.

For instance, speaking of a battle that happened perhaps three generations ago, he will say "I defeated the enemy there," and give the name of the tribe. Or he may say, indicating a large tribal tract of thousands of acres, "This is my land," with a careless wave of his hand. He is unable to comprehend that this land could even be bought or sold or that he could be deprived of its use. Whatever may be his position in his tribe, the primitive regards himself as of

no particular importance. His ego is practically nonexistent except as he lives as one of the community, by the community and for the community with which he has been identified from birth and with which he remains identified even after death. Like the animals and plants, like the rocks and waters around him, he looks upon himself as a sample or representative of an indefinite multiplicity, which he can only conceive collectively as he would his own hair.

Moreover, in virtue of this psychic symbiosis the individual feels himself as a field of influence which includes all his organs, as well as his appurtenances and personal belongings. Also he feels himself surrounded and affected by the fields of influence of other persons. In his belief a certain interchangeability of the parts of contiguous fields of different persons and animals is possible and occurs constantly. He also believes that every living thing is a localized manifestation of the universal life energy which may manifest itself in any number of places at the same time. Thus a child may be with its mother and simultaneously with its father who is hunting in a distant forest. The werewolf, the man-leopard, the sorcerer-crocodile are created by surrealist combinations. By the radiations, as it were, of its constituent fields of influence, all the members of a group may be concentrated in an individual, just as an individual may be diffused into all of his blood and flesh, as the members of his family.

All of these beliefs seem nonsense to us when regarded literally and materially. But there is a sense in which they can be said to be true in the world of psycho-reality, and they have meaning when interpreted in terms of the psycho-activity involved. These practices of primitive peoples remind one irresistibly of the conceptions of those supersensitives who have shown us that they can gain contact with a cosmic psycho-continuum of which space-time is the structural background. There is the same implication of invisible bonds between all the living, stretching in all directions through time and space, bonds which are strengthened and intensified by closeness of kinship or interests. A continuity of perception, memory and association in a universal medium provides threads which connect all things which psychation has once intimately touched. The genuine supersensitives—those who transmit knowledge derived from a superconscious which is aware of the roles played by individuals as radiating foci and fields of consciousness in the whole—revive the primitive intuitions and methods which have been termed mystic participation.

The primitive, however, differs from the supersensitive in that he does not regard his beliefs and attitudes as derived from an extra-

sensory source. Because of the quasi-physiological solidarity of the individual with the members of his group and the contents of his environment, and the facility of his psycho-communications, he accepts them as direct perceptions of an obvious and undeniable reality. Since the total course of his thinking and feeling, of his habits and wishes, is almost wholly determined by his collective unconscious, it is easy for him to remain attached to its larger life, keeping his ego-individuation at a minimum and his superpersonal orientation at a maximum.

There may have been a time in social development, when this psychic symbiosis of the separate human primates was so dominant that there was no individuality whatsoever in our sense of the word. As among the insects, each physically discrete individual in such an early society was only a subunit of the real personality—which was the group principle as it was organized by mystic participation. But the necessities of human evolution gradually produced an atrophy of the supersensitive faculty. It was sacrificed for the possibilities of a new kind of individuation in an organism such as man which could make for itself tools, machines and arts, new organs and ways of living which were detachable and removable. Of these machines, the first and most important are, and always have been, words, symbols of ideas.

Man has been defined as the toolmaker, but he could much more satisfactorily and accurately be defined as the idea maker, the maker of words. And the inventions and discoveries of language and their recording in symbols were the work of differentiated individuals. A certain privacy of signaling and meaning emerged with the rise of individual differentiation. There followed a consequent lapse and functional atrophy—the atrophy of disuse—of the transmissions of psychation effected by the older symbiotic method. So finally the faculty disappeared in the face of the new method of communion.

7. INDIVIDUATION VS. SYMBIOSIS

There can be no doubt that the individual's achievement of personality, the realization and fulfillment of the distinctive potentialities which differentiate him from his fellow beings, is the supreme test of any human culture or civilization. Even the incompletely integrated and experienced personality adds to its values and contributes to its advancement. In the last analysis, all human history has consisted of the accomplishments and adventures of personalities

who in one way or another have emancipated themselves, perhaps only to the extent of one idea or one taboo, from the compulsive pressures of the group, and ultimately redirected the course of its development. There can therefore be no motive for establishing a new fetish out of dissolution of the individual in the collective.

Each individual contributes, in one way or another, to the total psycho-activity of the universe. In some, refinement of the senses and a critical purification of thought and reasoning, a steady progression and clarification of ideas and methods, lead to that objective. In others, intuition and insight proceed at an accelerated rate in different directions toward it. In still others, the movement of differentiative personality carries forward to a seeking for a dynamic symmetry and balance of grace and beauty, which represent an economy of energy in the adjustment to it. So the special significance of personality cannot be overlooked or underestimated in any approach to the revival of psychic symbiosis in the mystic participation.

No human society can therefore ever be expected to acquire the patterns of a hive or a termitarium or of the primitive horde or clan. Even if it were possible, it would not be desirable from the standpoint of either human or cosmic values. For it cannot be expected that the whole evolutionary trend to a more sharply defined individuation, which has progressed from the time of the appearance of the first cellular aggregations and organizations such as the sponges and jellyfish, will be completely reversed.

It is only in the crisis of our wars that suppression of individuality suggests the fundamental depersonalization of the primitive mind. In the regimentations and subordinations demanded by total war, accepted without question, the same attitudes and practices seem to be sustained. But in this case it is something learned and acquired, beaten and driven into the individual, or imparted by hypnosis, and is nothing like the psychic symbiosis of mystic participation.

Our war organization resembles that of the tropical jellyfish known as Portuguese man-of-war. In the face of a common enemy, these free swimming individual fish cling together and transform themselves into specialists to serve the composite superindividual. They assume the functions of feeders and digesters, connectors and holders, reproducers, stinging attackers and defenders. When the occasion no longer demands their conjunction, they discard their specializations of structure and function and return to their previous individuated and independent condition. We do the same between wars.

8. NATURE OF MYSTIC PARTICIPATION

The essence of the mystic participation consists of the establishment of certain psychic connections between the individual and the whole of life whereby he sees himself included as part of a collective enterprise. The individual's field of consciousness, and its penumbra of the unconscious, become linked with a network of oneness which cannot be explained by direct or indirect sensory contacts or associations such as are familiar to common sense and science. These connections are not merely projections and identifications by which the individual fails to distinguish between himself and his experiences. They are of the nature of continuities which may be called tele-participations to indicate that they take place and act at a distance and are definitely analogous to and suggestive of telepathy.

The forces involved in telepathy and psychic symbiosis must be fundamentally the same. The study of extra-sensory communication, of which telepathy and clairvoyance are examples, is only now being opened to scientific research. These can be and should be carefully investigated in the same way as more easily accessible and controllable biological and psychological phenomena. Much light will then be thrown on mystic participation and its deliberate revival for human co-operation and mutual assistance. It will become possible for the individual to become projected into a region of psycho-activity by approaches and operations now utterly unknown and uncomprehended by his isolated consciousness.

No hypothesis concerning these tele-connections can explain as many of the pertinent and verified findings in the field as does the conception of a psycho-continuum involving the collective unconscious and the collective superconscious. Energy is operative in their manifestations, a psychic energy or psycho-activity, concerning the properties of which we know little scientifically but enough empirically to compel us to recognize its existence and its interactions with other forms of energy such as heat, light and electricity. Psychic energy is at work in us and in all organisms as well as in the life-personality and the cosmos as a whole. The participation in the totality of that psycho-activity is the essence of the mystic participation.

The energy of that participation has a dynamic relationship to the other forces of the universe. Whatever the ultimate concepts of science concerning the structure and behavior of the various forms of energy, the facts of the supreme organizing and directive powers of psycho-activity and the energy of psychation in the cosmos and in

life will remain and retain their dominant significance. Any scientific understanding and interpretation of the phenomena of mystic participation must wait upon more knowledge of things than we now possess.

How the psychergia is transformed into other kinds of energy and how it then returns to its original state is the secret which probably contains the solution of the problem of mystic participation and its deliberate control. Though its operations cannot be identified with electricity, electricity seems to be generated wherever there are manifestations of psycho-activity. Along the fibers of nerves, for example, whenever they are stimulated, there flows an energy known as the nerve impulse or current which is always accompanied by manifestations of electricity designated by physiologists as the action current.

Psychergia has become concentrated in the functionings of the nerve cells of the brain it has engendered. It can be shown to broadcast electrical wave systems which can be recorded, and which have been demonstrated to vary with the characteristics of the individual's thinking and feeling, and with sleep and wakefulness. During wakeful consciousness these electrical waves appear about every tenth of a second, while during sleep they are slower and less regular, their rhythm fluctuating between one-half and three seconds. In epileptics having convulsions, and even before, the electrical phenomena correspond to the explosive quality of the patient's consciousness.

Altogether, it would seem possible that just as a group of electrons in motion, or a moving electrical field, begets magnetism, and magnetism induces electricity, psychergia and electricity are similarly related. The electrical field may have psychic properties while every psychic field has electromagnetic properties. Thus we may be able to understand how individual psychic fields of influence interlock in the cosmic psycho-continuum when we comprehend how individual electromagnetic fields participate in the space-time continuum.

But we cannot wait for the advent of this scientific knowledge concerning the dynamics and teleo-mechanics of the relation of the individual to the whole before accepting and practicing the reality of mystic participation. The recognition by mankind of the evils of morbid individuation, which is man's chief affliction, the despairs and suicides, the crimes and depravities which it brings to isolated personalities, necessitates the revival of the psychic symbiosis which was once the common possession of all men. Realization by mankind of the totality of overwhelming evils that follow in the train of dis-

sociation from the life-personality cries out for the immediate return of the mystic participation as a value of daily life.

As each of us tracks his way through a darkling maze of instincts, appetites, ignorances and perceptions, frustrations and fulfillments, he needs the assurance that he is following no blind alley that is the limitation of his personal self. If he learns to see again, by a combination of intellectual and emotional insights, the invisible guiding lines in the labyrinth wherein he moves and has his being, and the drive pressing him on to greater-than-personal goals, he will be redeemed and saved. Out of the perplexing contradictions of the dugout in which he has buried his ego for its protection and aggrandizement he will emerge into the light of a great illumination.

To be released from his isolation he must return to a reunion with his fellow men, his fellow creatures, with the earth and the stars, with the very heart of the cosmos itself. No need is more urgent for modern man than a renaissance of the ancient consciousness once so natural to his primitive ancestors. There is a call of blood and memory that the civilized and individuated egos of our time must consciously and deliberately respond to and assimilate with the contributions of science to his reason. For the unification of mankind the filaments of psychic communication and transfusion between individuals must become world-wide. The latent possibilities of a universal psycho-activity, that long ago held whole groups and populations together in a network of identity and integration, and which have now for so long remained obscured like the image on a photographic negative, will at long last be revealed to the eyes of all of us.

The findings of critical intelligence and intuition providing the syntheses of scientific method will support us with the solid foundation of ascertained fact. But also in such a renaissance of mystic participation there must be added to the strength of factual conviction and innermost persuasion of its truth and reality the power of communal song and speech. There must be revived everywhere the collective modes and methods of evoking and celebrating the ways and values of the life-personality, to make them the realities of everyday life.

The achievements of artists, in which all can share the contemplation and purpose of the creative work of life, have always evoked that haunting sense of that-which-is-beyond-the-self, like the refrains of old, forgotten melodies. Their effects have been used from time immemorial in releasing the individual personality from the constraints of the ego. To make all human beings conscious of their protoplasmic continuity and oneness and the psychic solidarity underlying their dif-

ferences, remains the supreme task of the artist in every field. And this continuity and identification is not simply with a group where-with the individual perceives a relationship of self interest, but with the fellowship of mankind, with all the manifestations of life, and with all the driving forces behind the cosmos, for they are all one.

To regain the most important realities of his life, which is to regain his larger life, the individual must indeed lose himself—his personal self—in the return of mystic participation. As he once learned and developed his power over fire, which opened a whole new physical universe to him, so he must now learn and develop anew his psychic powers which will open for him a totally forgotten reality. He must learn to use psychation, as he now uses radiation, to put him into closer touch with his fellow beings and through them with all of life and the universe. Only then will the loneliness and isolation of the individual consciousness, with all its destructive consequences, be abolished. He will then see himself and his fellows, as he perceives and deals with them day by day, not as a mere collection of warring entities, nor as forever separated self-centered monads, but as a unity of intercommunicants and interparticipants in the great design and enterprise of cosmic evolution.

9. HUMAN FELLOWSHIP AND COSMIC COMMUNION

Throughout the ages, certain individuals here and there have reported a direct revelation of the basic affinities between humankind and the life-personality and the cosmic forces behind it. Their revelations have possessed an extraordinary and supernormal quality which has contrasted them with workaday life and psychation and so they have been called mystic as opposed to the rational. At the core of every such mystic revelation has been the direct perception, without the intervention of reasoning or logic or indeed any intermediary whatsoever, of an all-pervading ubiquitously operative supreme personality in whom all beings are united as one. Such a perception really amounts to a universal apperception, a perception which includes and transmutes all perceptions, past, present and future, into the single reality by means of an identification of the self with the cosmic: a cosmic communion.

It is the essence of the cosmic communion that it is a personal experience, like being in love, bearing a child, producing a poem, an experience at once profoundly illuminating and ultimately ineffable. It fills an aching void in the heart of the isolated individual, and completes the system of his psycho-reality in a pattern that ex-

tends into the infinite and lasts forever. It is accompanied by an emotion of cosmic ecstasy which provides it with an authority and sanction with which no other value can compete.

Interpreting the poetry, the metaphors and the music of the language in which the mystic struggles to convey the substance and meaning of his unique experience, there emerges a central nucleus in each of his communications: the establishment of communion with a personality larger than that of the communicant, the personality of the universe. That is the dominant fact upon which all agree, in spite of all differences of words, images, references, local conditionings and historical settings. The personal background and the educational bias of each individual exhibits itself in the utterances of his sublime experience. But the common denominator of each, from ignorant peasant girl to learned scholastic is the same: that a new significance has been given human fellowship and human relations by the discovery of a link to the superhuman, in effect, the super-conscious. It is as if a child seemingly deserted, an outcast from all that is warm and vitalizing, were to find again and return to a father and mother whom it thought forever lost, and to a multitude of kith and kin to whom it is blood-related and sympathetically attracted.

These poetic oracles add to the evidence for a universe-wide reservoir of psychation, for a cosmic psycho-activity with which contact of the telepathic, supernormal order is possible for human beings. Thus the utterances of the prophets, too, must be built into the total body of a scientific understanding of life. In so far as their method has proved valuable, integrative and stimulating, it should be collectively applied for the restoration of the health of our species.

It happens that most human beings do not possess or have lost the capacity for such immersion in the depths of cosmic communion. They have received the reports of the specially gifted sometimes with awe and reverence, sometimes with skepticism and scoffing. But no one has scanned the mystic revelation without marveling at the exaltation of consciousness, and at the release of hitherto latent powers of human fellowship and co-operation, for some. For many others, however, such revelation has provided an initiation into a private code to the secrets of the universe, and a mode of salvation of the self which let the rest of the world go to limbo. Some became great preachers and teachers, founders of sects, inspirers and directors of group organizations. But others retired as anchorites of consciousness, aloof from contemporary pain, disease and waste.

It would be a miracle if all doctrinal anachronisms could be dis-

solved in some vast vat of psychic sanitation through the concrete data of science and the rational interpretation of their meaning. Favored individuals may have been vouchsafed illuminating perceptions of the significance of life. But the great run of humanity, and particularly educated humanity, has been skeptical and disillusioned, caught in the maze of many dilemmas culminating in endlessly recurrent wars within the self, as well as without. Too many frauds and cults, too many exploitations of superstitions and confusions were built upon these mystic states and still thrive. The needed cleansing can come only through learning and assimilating new foundations for ancient perceptions and intuitions. The return to mystic participation must come through a consistent pattern of knowledge and behavior with techniques freed from the malodorous associations of the past.

This revival of a universal psychic symbiosis, moreover, by the restoration of general tele-connections between all the living, reuniting them with the totality of life and the cosmic source of all psychation, is the only means of salvaging mankind. No blueprints of economic reconstruction or plans of social rehabilitation based upon the claims of equity and justice, nor yet the demands for equalization of opportunity and privilege which have been advanced for the therapy of man's chronic unhappiness and suffering, can succeed as long as the individual consciousness is confined within the barriers of a bounded self. A tortured transient of mundane mortality will always remain.

A narrow and isolated consciousness must compensate and drug itself, during its lifelong sentence of solitary confinement, by a lust for self-aggrandizement and by the predatory exploitation of others whom it must look upon as alien. As the historical record proves, the individual will frustrate and defeat again and again the most equitable and the most rational, the most humane and the most informed aspirations and efforts toward a new and better social order. And no other interpretation of history can explain, save superficially and myopically, the struggles and conflicts of these isolated individuals for the acquisition of power and domination, the urges and surges of their aggression. The secret frustrations of the isolated ego, and its cherished schemes for escape through the bars of its psychic imprisonment have strangled every movement for the abolition of human antagonisms and the establishment of mutual aid and co-operation since history began.

The return to mystic participation will involve no renunciation of the values inherent in the individual personality. No ascetic denial

of its existence or importance needs to be associated with the renaissance of psychic symbiosis, no masochistic or sadistic self-mortification of body or soul. Differences between personalities may become more sharply accentuated than ever without incompatibility, provided they function freely within a dynamic continuum. Hyperindividuation, however, in the sense of a hypertrophy of the ego, the overgrowth of the ego which might be termed an egoma, which cuts the individual off from the heart of reality,—that will be prevented. But individuality as a concentrate of psycho-activity at a focal point of the continuum of participation will remain and grow more meaningful.

Man's chronic unhappiness has been due to the poisonous privacies and destructive discontentments bred of his individuation. He has been continually engaged in a search for the meaning of his individual life and a quest for a way and formula of release from the chains of his self. Now he becomes aware that his innermost suffering, keenest of all pains, is due to his withdrawal from the total life-personality and the contraction into himself of the vast possibilities of the psychic life. Man's search for significance in his existence and a road to contentment can be satisfied only in the achievement of a progressive harmony between his consciousness and the whole of life. Such a lasting and continuous harmony can be reached solely by an expansion and the merging of his individuality with the cosmic psycho-continuum, the experiencing of which is the essence of mystic participation. And only in that way will the universal disease of splitting of the individual from his source, and the consequent production of multiple dissociated isolated personalities, be cured.

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12

THE GOD OF EVOLUTION

THE CONCEPTION OF GOD IS ONE THAT HAS HAUNTED MAN THROUGH the ages. Man's consciousness of a being higher than himself, ineffably greater and more comprehensive than any human being, has been an intuition from his earliest days. The intuition has articulated itself in many images. Its power over the imagination has dominated art and science, man's attitudes toward his environment, his customs and his institutions. And whether plastically expressed in idols or psychically realized in philosophy, it has functioned as an immortal idea.

1. MANKIND AND ITS GODS

The vicissitudes of human history have ground many gods into dust. The gods of tribes and nations have been superseded by more inclusive gods, until at last it was seen that these lesser gods were only reflections of a simple underlying universal reality: that God must be one, that He was the only God. So at long last His unity was apparent and became the symbol of the unity of all mankind.

But at different times and places the content of the idea of the one God and the only God has varied in curious contrasts of meaning. The God of the Christians has been differentiated from the God of the Mohammedans as has the God of the Jews from the God of the Zoroastrians. The God of the realists is anathema to the God of the idealists. So many and so contradictory have been the ideas of God that they have rather been grounds for collision and division among men than for cohesion and peace.

Philosophers and priests have created strange gods. They have made them magistrates of cosmic police courts to punish evildoers and to reward the deserving. They have made them mathematicians, constantly thinking in formulas, no one knows for what reason. That word in the dictionary which stands for a word independent of all words, the Absolute, is also a god, an awesome abstraction in which

all relatives are suspended in a state of arrested animation. The Absolute becomes the limbo for all queer psychological necessities of the human mind. But all these gods have proved themselves inadequate for the unification of humanity. Mankind behaves as if these gods were powerless. There can be no doubt that they have failed.

Indeed these ancient beliefs in the fatherhood of God and the brotherhood of man now sound like the most desiccated of platitudes because they no longer bear the pressure of dynamic realities. Yet there never was a time in the history of mankind when there was a more intense need for a validated conception of God to restore those bonds of unity and solidarity between men that religious beliefs provided in the past. Humanity has slipped loose from its moorings—rational, cultural and social—in the fast and furious developments of the last decades. Economic and political careerists divide and redivide human beings in senseless conflicts. The individual is lost in the general turmoil of hysterical outcries and paranoiac herdings which compel him to raise his brain, heart and hand against his fellow man.

As a result there has been continuous war among men, welling up like the eruptions of long-smoldering volcanoes, out of deep-seated repressions of suffering and longing. For in his heart of hearts, the unconscious psychic life, which is the profoundest analyzer and estimator of his values, the individual knows this to be an intolerable state of life. The relatively sensitive and enlightened who have given up, or who never have cultivated, continuity with a particular creed or membership in an organized sect, suffer more immediately and directly than the others. Through the pace-makers for the mass of mankind, a great proportion of the traditionally devout have abandoned their religious affiliations, for they have become affected by the same distress, in the depths of themselves, less consciously perhaps, but just as definitely.

A ubiquitous restlessness and tension, confusion and disorientation, have followed the rejection of the old traditional doctrines and familiar beliefs. The dogmatic tenets which were good enough for their forefathers have become empty, deprived of any compulsive authority and sanction. This deliquescence of the older bonds of humanity has reached such an extreme that the capacity for any belief has been radically weakened and submerged. Men cannot believe, they cannot compel themselves to believe, in any idea, because they have completely lost touch with one another as well as with that out of which all of humanity and life has sprung.

It is as if a single person discovered in himself many persons, all in opposition, mutually skeptical or scornful, and each determined to dominate at all costs. Yet at the same time he who dominates is estranged from himself, for the others are all part of himself. So he is driven into the wretched status of that isolation and loneliness which leads to absolute abandonment of any hope for reunion, or for re-integration with that which is the larger portion of himself.

Mankind is groping in the shadows, blinded to any vision of itself as a whole because its oldest illuminations have been darkened and there is no knowledge of how to replace them. How are we to penetrate the darkness in which men's souls are shrouded and thus relieve their confusions in the depths of the isolation to which they seem forever doomed by limitations of body, time and space? For everywhere may be heard clamorous explosions registering the breakup of the old ideas and the old methods that once held men together.

There can be no solace in old dogmas to be accepted for the sake of believing in something that may effect a cure. For that is too difficult, indeed altogether impossible, for those who have grown up in the realism of modern times. We will not surrender reason and science, because their accomplishments are terra firma which modern man will not leave for ignorance and superstition even though the heavens remain clouded. Into such regression we have not yet retreated nor can we ever retreat.

An assured conviction of the identity of their personalities and interests, rooted in the common blood and psycho-activity of a super-personality which includes them all, must spread among all individuals, families, groups and classes. Only that conviction and its applications in social institutions and practices will dissolve the apparently irreconcilable differences and antagonisms and obliterate the neurotic hostilities and hysterical hatreds which are the inevitable outcome of ignorance of men's cosmic and protoplasmic origins and kinships, of the concordance of their needs and satisfactions. Only utter obliviousness to the invisible fibers of flesh and memory, functioning and participation, which bind all human beings indissolubly together into a single organism, has made possible the fantastic extravaganzas of self-torture and mutilation which is the present state of mankind.

2. THE AWAKENING OF MAN

Everywhere human language exists, that renaissance of identification of each with all and all with each must be achieved in words

that shall ring out as if all the great bells of the world were set pealing them at the same time: that all human beings, in all their variety and manifoldness, represent the infinite diversity of the one comprehensive and universal Being that merges them into itself. They are all the offspring of that one creative being—life. Together with all the living they constitute the latest and most advanced buddings and growths of the life-personality, which is itself the organic creation of the cosmic godhead.

Humanity has been like a somnambulist split from his real wakeful self, and its members have fought and murdered one another like sleepwalking maniacs. Only then will the internecine struggle within the body of mankind between groups, large and small, as well as between individuals, be ended, when conscious application of the significant discoveries of science concerning life and the universe and their meaning for the individual, establishes once and for all that basic understanding and rapport between men, which will cause them to behave as the intimate participators in a common great project, the greatest of all enterprises, as assistants of the creative cosmos, without question, doubt or reservation. Then they will awaken from their violent insanities, as do those who have been shocked out of madness.

Convinced of the interdependence and solidarity of all the varieties and individualities of humanity, men will come to see themselves as limbs and branches, organs and tissues of the single life-personality in whom they merge their wills and lives, their experiences and productions. They will be educated to regard these conceptions as being as objectively true and as compellingly real as their bodily appetites and selfish interests. For these truths are not merely the doctrines and dogmas of sects and schisms, nor the devout romances and pious hopes of wistful, wishful thinking, but rest upon a convergence of lines of evidence and are richly confirmed by concrete details and venifiable observations that have been systematically gathered in varied fields of research. Men will become steeped in the meaning of those correlated manifestations of life and the cosmos. Contemplation of them will inspire awe and reverence more profound than that born of the most moving miracles and revelations. For the discovery of the underlying and far-reaching unity of all of life, of the fitness of earth for it, and of the service of life to the cosmos can be surpassed in wonder by no lesser incidents and spectacles in the history of humanity!

A tremendous synthesis of the known and the unknown is at hand

and no one can gainsay its necessity. Out of the hopelessly contradictory and conflicting maelstrom of attitudes and customs, religions and philosophies, languages and governments, territories and boundaries, social institutions and economic systems in which so many individuals and nations have been wrecked, mankind must steer its course to the mainland of this synthesis and unification. And upon that land will arise the beginnings of a new humanity, linked with the visions of its early prophets, because it has recovered the meaning of their primeval oracles, and rediscovered them in that sound and critical approach to reality known as science.

Certain conceptions must be universalized in education and discourse as basic for every human being. First comes the fact that all human beings are descended from the same ancestors in the comingling of various ancestral strains in the past, and all will mingle their blood in their descendants. That is one of the prime teachings of biology. All human flesh fuses in a single mass as the materials of heredity are distributed and redistributed in the successive generations of interbreeding and crossbreeding. In the germ plasms of mankind, the psychic power of memory, never lost, has always stored and restored, held and reproduced the experience and personalities of ancestors as far back as the beginning of life. Viewed in its entirety, mankind is the history and the memory of one personality, that of the life-personality. The isolation of the individual, chained to his own limited consciousness by the self-protective necessities of his ego, can be broken down by revealing to him how blinded he has been to his vital continuity with the deepest reaches of the past and the dynamic sources of the future.

In the perspectives of time-space, the matrix of cosmic psychation, the individual is only a cross section in three dimensions of that stream of continuity which is a single superorganism and superpersonality. Life does not stand forlorn and lost on this planet, does not strive and suffer on this earth like a mariner marooned on an island never to be visited by a salvaging craft from a greater world. Life's habitat is but the fragment of a star, to be sure. It seems like a leaf swept by the wind in the face of the huge galaxies and supergalaxies, the inconceivable extent and duration of the universe. Yet life is no fluttering leaf, but a tree firmly rooted in the laws and purposes of the cosmic elements.

The second great awareness that should be spread to the ends of the earth is the idea that our planet was prepared for life. Chance could not have built its precarious but triumphant structure. It is

no waif, lost in the streets of space and time, a voice crying in the wilderness. The correlations and integrations of life and environment and the conditions of their interadaptations can be traced to the very depths of the elements and atoms themselves. This preparation is not simply a rare curiosity of the cosmic adventure, nor a freak of its progeny. The properties of the elementary chemical constituents of the stuff of life, protoplasm, are uniquely fitted for its evolution. The era of pre-life, the dance of the earth and the sun, and the other remarkable adjustments which maintain them in exquisite equilibrium, must be regarded as staging the scene for the appearance of life. Everything facilitates its emergence and its ascent to higher and more complex systems, the highest being the organism with a brain capable of maintaining and increasing complexity with no definite limit to its evolution.

That there is such a unique arrangement for and predisposition toward life in the intimate constitution of the cosmos, in the very heart of its deepest processes, can mean only that psychation which is its most distinctive characteristic, is a manifestation of, in fact a continuation and extension of, a cosmic psycho-activity. This cosmic psycho-activity cannot be located in a defined three-dimensional body, as is human psychation in the brain. It can be conceived only as the organizing and directing energy of the continuum which modern physics has made of space, time and action. Dispersed in island universes which have evolved out of the original universe, it evolves that reality of ultrahuman dimensions of which human science is now beginning to have a glimpse.

All that we can say about this cosmic psycho-activity is that it is set upon constructing ways and means of concentrating and stabilizing its energy in more and more complex systems. It can therefore be inferred that its dynamic activity is subject, like all other energies, to the universal law of degeneration, the law of entropy. It is possible thus to compare its fate with that of the other and lower forms of cosmic energy: electricity, magnetism, heat, and light. A slow but inevitable decay and death overcomes them all. That degeneration can be observed in the workings of our own psychic energy and in the span of our own lives.

Life struggles with death everywhere, and its struggles become the symbol and epitome of a universal conflict. Its psychic energy becomes involved with its own products of degeneration, as it were, and cannot be completely separated from them. Its activity is always associated with energy changes and the degradation of energy poten-

tials. So the energy of the cosmic psycho-activity, subjected to similar though much more gigantic energy changes, undergoes a similar degradation on a larger scale.

The domain of the psychic extends throughout the universe. Flashes and momentary emanations of individual consciousness may occur in all molecular and atomic reactions, which may account for the fact of a certain degree of freedom and variation observed among them by physicists. In the larger and more permanent combinations of matter and energy in the cells of living protoplasm, psychic activity reaches a more stable habitat and the beginnings of memory for the psychic fixations of individuality, as a matrix of personality, are established. The excessively feeble psychic flashings of the individual atoms and molecules may become compounded, much as the electrical charges of tiny batteries may be arranged in series and accumulate considerable voltage.

A concentration of psycho-activity as protoplasm organizes and directs the physical and chemical forces within the living stuff into an integrated system with the parts functioning for the good of the whole. The history of evolution is the history of the co-ordinations and regulations that have been worked out in protoplasm for the preservation, stabilization and progressively greater complexity of that psycho-activity into forms acquiring an increasing and more efficient domination of the transformations of energy. Its ultimate objective, as deducible from the evidence, is to become entirely independent of the conditions limiting them and so freed from the menace of dissolution.

Knowing the law of the degradation of all energy including its own, the cosmic godhead foresees the end of the universe in the total loss of all potentialities, and the cessation of all that is dynamic in a perpetually static level of inactivity. It foresees its own death in that changelessness. It is that logic which provides the clue to the underlying trends in the preparation for and evolution of life on earth. The long slow struggle of living things to evolve into dominators of their environment is really the history of the continuation of a cosmic struggle, the drive of the cosmic consciousness to save itself and renew itself, and, in the end, to immortalize itself.

In so far as we understand its history at all, life represents a reversal of the law of entropy. As species increased and multiplied, individuals have constructed themselves into systems of greater and greater energy content, which can bind energy into more and more complex, more and more stable and more and more durable forms. In man

this tendency has reached its acme. For he has not only become conscious of the process, inventing and improving nonliving machines as aids to his purpose, but he is seeking ways and means of penetrating into the ultimate secrets of energy, in all its combinations, degenerations and regenerations. All his researches are really directed to that objective, and thereby to the emancipation of consciousness from its material conditions and dependencies. This, the chief research of mankind, will mean in the end the attainment of a genuine immortality for the life-personality and the cosmic forces behind it.

Consequently there can be envisaged a ladder of individuation in the evolution of life forms as regards the consciousness of God. There are those on the lowest rungs, the entirely self-encapsulated, completely undifferentiated in their kinship with all of life and pre-life; much like those vegetative cells in our own bodies which feed the brain and the unconscious. Then there are others who are barely conscious of their participation. A few here and there in human history have consciously participated. The time is coming when there will be more and more of the informed and inspired who are sharing, with fully opened eyes, in the growth of the greater personality of which they are parts.

3. THE EVIDENCE AND ARGUMENT REVIEWED

Man, utterly alone, seems lost forever in the maze of eternal mystery. And, in view of the unfathomed immensities of time and space in which he wanders, who dares to speak to him of that which is beyond space and time? In the face of innumerable lacks and discrepancies in his knowledge, who will be so bold as to proclaim, in words that are themselves but halting and inadequate signposts pointing toward the truth, that thus and thus is the truth of things?

For we are only too conscious of limitations in the instruments at our disposal: the brain and its appendages and its inventions, for probing the overwhelming enigmas of life and the cosmos. We gaze wistfully at the great wall which separates us from eternity and infinity and the continuum in which they are immersed. We knock at its gates incessantly, and we bruise our fingers and our souls as we listen to the echoes: But its barriers resist our admission to the new lands of insight and understanding that we crave, in which we might feel at home in the universe.

Yet, for as long as we have known anything of man's thoughts and feelings, he has concerned himself ceaselessly with his relations to all around him, the living and the nonliving, the earth beneath his

feet, and the sun and stars above him. It has been a necessity of his psychic constitution to question these things endlessly and to seek with insatiable curiosity to penetrate to the heart of their meaning. It has indeed been essential to his very survival, for him to live with some reasonably consistent conception of the nature and properties of things about him in relation to himself.

At various times in the past men have huddled for safety under the shelter of various religious dogmas, assured of a simple organic unity between themselves and the rest of the universe. As those dogmas were discredited by the advances of knowledge, and as men have emerged out of their intellectual childhood, they have come to feel and see themselves as aliens in a strange land, as they contemplated the bleak silences and impenetrable indifference of the world revealed by science. They have been driven back into themselves for any hope at all, straining their ears for the heartening revelation vouchsafed only to a mystic few, or they have despaired of any real illumination, or they have yielded themselves to the anodynes of superstitious ritual or fanatical bigotry.

Now an examination of the available data as they have been sifted and arranged by their more searching investigators, discloses correlations and significances that were not suspected in the first flush of the revolutionary triumphs of the scientific method. Actually, inspection and synthesis of the facts, and the ideas associated with these scientific data, lead to an entirely different interpretation. That interpretation, which a number of converging lines of evidence corroborate, confirms the ancient primitive's intuitive perception that we are all composed of the same single substance and energy, and that we are bound with the earth and the cosmos by links of continuity that reach into its most intimate activities.

A universal psychic order pervades the whole of things, an order disclosed by a series of observations all of which point to the same conclusion:

1. The basic chemical elements—hydrogen, oxygen and carbon—which combine with nitrogen and others to form protoplasm, the physical basis of life, and which themselves (and particularly as their compounds, water, carbon dioxide, carbonic acid and carbonates), preceded its appearance, possess a fitness for their functions that is unique, that cannot be explained as the effects of statistically operating, mechanical or quasi-mechanical laws of chance or averages. Nor can it be considered an example of rarity emerging out of probability

because the roots of that fitness penetrate to the very beginnings of the cosmos.

2. The formation of the earth and its physical conditions conspire, in a number of singularly adequate ways, with the properties of these chemical elements to make possible the survival and progressive evolution of the various structures and species of protoplasm. Chance alone could never have produced their life-adapted appropriateness, possessed to a degree that is completely inexplicable in terms of blind coincidence.

3. The coexistence, and co-operation as an ensemble, of these chemical elements and physical conditions, moving toward the production and facilitation of life, implies that our world was prepared for it by a cosmic psycho-activity.

4. The universe in which this cosmic psycho-activity is embedded is an organic whole of ultrahuman dimensions and lines of association. It can best be described and comprehended as a psycho-continuum. It is inextricably involved with universal energy and itself interwoven with the pattern of that energy, a cosmic organism with a history out of which protoplasm is a direct and continuant outgrowth.

5. The steps of the organic evolution of species from lower to higher forms, and the recapitulation of the evolutionary series in every individual development, from one-celled creature through embryo and fetus, to mature representative of its kind, exhibit the characteristic psycho-activity—memory, awareness, and direction—of a single superorganism properly called the life-personality, for it unites in itself the bodies and minds of all species as its tissues and organs, and all individuals as its cells.

6. The psycho-activity of the life-personality—continuous and identical with that of the universe—is engaged in a fundamental struggle with what portends the death of the cosmic organism, the law of entropy, and the consciousness of the life-personality is the spearhead of a cosmic drive to reverse the ultimate degeneration implied in that law's universal operation.

7. This cosmic drive provides the most satisfactory clues to the underlying movement of organic evolution—the steady pressure toward the development of complicated systems of energy capable of holding and embracing successively higher stages of psycho-activity, which exemplify a general law of anti-entropy.

8. The psychic forces in the history of evolution are the predominant ones, while the nonpsychic are secondary and subsidiary in their effects. Such an explanation of the evolutionary series does not pre-

clude, instead it includes, the concept of a teleo-technics—mechanical models or apparatus achieving certain objectives, of variation, mutation, adaptation strictly subject to the law of cause and effect. The life-personality cannot escape the logic of substances and conditions, and operates within its own laws, just as the cosmic psycho-activity cannot escape the law of entropy, and must work with the possibilities at its command.

9. The analysis of those manifestations, productive and progressive, or destructive and morbid, of human psycho-activity, which have become known as the unconscious, may be generalized as providing the veritable links between the creative powers of life and the universe, which are basically the same.

10. There is abundant evidence that, operating behind and including the individual unconscious, is the collective unconscious and super-conscious, which incorporates the contents and associations of all individual psycho-activities of our earth, as would be expected if a single life-personality existed. Moreover, the lines of continuity between the cosmic psycho-activity and the life-personality constitute them a single network.

11. Life, then, is most intimately and directly concerned with the origins and destiny, the birth, struggles, and fate, of the rational cosmos which has purposively created it.

12. Because life must work with individuals as localized systems of energy concentration, its chief dilemma has been the reconciliation of the necessities of individuation with the collective imperatives of groups.

13. The resolution of the basic, mutually destructive, conflict between individuals and groups in the life-personality must be achieved as a cure for the disease of dissociative hostility, aggression and exploitation which now threatens attainment of its objectives whenever it succeeds in evolving a species capable of carrying them to completion.

14. There must be a return to the practice of the mystic participation which reconciles individuation and community. Then only will it be feasible to safeguard and emancipate the individual consciousness from its material conditions and to realize its greatest possibilities for the life-personality and the cosmic psycho-activity by a deliberate application of the findings of science.

With these perceptions and principles, mankind can be united for the first time in its history by an alliance of the new cosmic insights of science with the older mystical affirmations. This would be primarily

a psychic alliance, a union of minds, because it would be founded not only on the words and deeds of intelligent and informed individuals, but also upon the intangibles and imponderables of a truly universal rapport of all humanity. It would not be limited by any set of dogmas or rituals or any sect or credo, but it would be the fellowship of all men and all women who are united by the realization of the community of their consciousness in the past, present and future—their co-consciousness—with the God of cosmic evolution.

The facts of the evolution of the cosmos, of the evolution of the earth, of the evolution of life, demonstrate the existence of that God objectively and inductively. There has been a general agreement about evolution as a process. Evolution backed by psycho-activity has long been in conflict with conceptions of a purely mechanical evolution. There can no longer be any doubt that psychic forces have functioned throughout the evolution of matter in life. The psycho-activity of the cosmos has a determining influence in that evolution. These evolutionary backgrounds provide a common meeting ground for all individuals and peoples, races and nations.

4. THE RENAISSANCE OF GOD-CONSCIOUSNESS

A religion may be defined as a set of beliefs and convictions, of realizations and practices which serve to bind men together into something greater than their personal selves. Religion requires neither church, synagogue nor meeting place, for it operates within the individual, as the center of his psychic realities and values. The religion of the future, the religion of the life-personality within the cosmic consciousness, of the God of the universal evolution, need not be housed in stone or wood. It will rather be a fellowship of world order, a union of the participants in God. It is its basic tenet that all human beings can feel at home in the universe, because they belong to it, not by any arbitrary turn of destiny, nor as accidents thrown up by a fortuitous combination of circumstances, but by virtue of their organic nativity and protoplasmic continuity.

We are not merely particles of stellar dust, but cells of the great cosmic being to whose history and preservation we are all essential. Each particular individual belongs to it, no matter how transiently and inadequately. Each acquires a new significance and dignity, a value and an importance of which he can never be deprived in the light of that relationship.

Religion and philosophy and science can, therefore, be conjoined in a union that will reverse the separative differentiations of the

civilized ego. We revert once more to the union of all knowledge, all thought, all feeling, in the vision of the whole which was so natural to primitive man. For that vision is founded on the solid rock of the ultimate facts of the universe, life and psychation.

Civilized men can now revive the sense of mystic participation and return to this conviction and its actual practice. Groups may be formed as centers of symbiotic education. Their activities may vary from silent meditation to the arts of moving rhythmically in unison, as in the whirling dances of the East. All the techniques of music and poetry should be marshaled for the revival of the emotion of collective communion. Such group participation may not be necessary for some individuals but it will be absolutely essential for most. In time all will develop to some degree the power of communal communication which comes from association with the cosmic psycho-activity to which each is a contributing consciousness.

The mind of man is made in the image of the mind of God for good reasons. The evolution of mankind is the vanguard of all activities and events in the cosmos. The life-personality has reached the stage of universal knowledge in man, passing through intuition and instinct to intelligence and science in the pursuit of its ultimate aims. This knowledge will lead to an understanding of the mechanical (in the sense of blindly operating laws) in nature, life and the history of humanity as a reflection of God using the laws of energy: matter and logic—indeed, he is bound by them because involved in them, just as a poet or a musician or an engineer are held within the limitations of their crafts and materials.

The fundamental principles of the universe are the means by which the cosmic psycho-activity keeps itself together. The consequent necessity of mechanical laws and operations of matter and energy, time and space, systems and patterns in the basic continuum has consecrated the principle of individuation. But the individual has turned the life consciousness into a multiple dissociated personality. Its reintegration by the renascence of the mystic participation will not only take the individual out of his solitariness—every man out of his isolation—but it will bring salvation to our species in its enlistments for the service of God, the God of evolution, and further his growth and his work for the continuation of his consciousness. God-consciousness must become the dominant, central, continuously operating idea of our lives.

He contributes to the consciousness of God who discovers truth, creates beauty, adds new treasures to the psychic possessions of man-

kind which are its only permanent possessions. The recognition of the reality of the God of evolution as *the ultimate fact of facts* and the identification of him with the cosmic drive of which the life-personality is the spearhead, is the only road to individual self-fulfillment. All other ways lead to blind alleys and dead ends. A new set of principles for the understanding and education of the individual in his relation to the whole can be brought into play for children and youths. Individual behavior must and will adjust itself and conform to these basic realizations and build upon its implications.

Men will come to a new and grander conception of personal immortality. They persist and endure as patterns of memory, as psychic personalities, within God's being and becoming. That is the only everlasting life possible for them. Men will learn that God Himself is only potentially immortal, however inconceivably vast be His wisdom and power. But men will be heartened by the knowledge that they can, however infinitesimally, assist Him to immortality by adding all they are capable of to the great work and the great purpose. For they are now engaged in discovering the ways of energy and the means of life, the technics of organization and the emancipation of consciousness from its limiting conditions, a project which is in the end the drive of the cosmic Godhead itself—the final defeat of death, the only death that can really matter—the death of the mind of the universe.

